the

TOOL ENGINEER

APRIL 1958

TOOL SHOW

convention issue

PUBLICATION OF THE AMERICAN SOCIETY OF TOOL ENGINEERS

the tool engineer

Vol. 40, No. 4 April 1958

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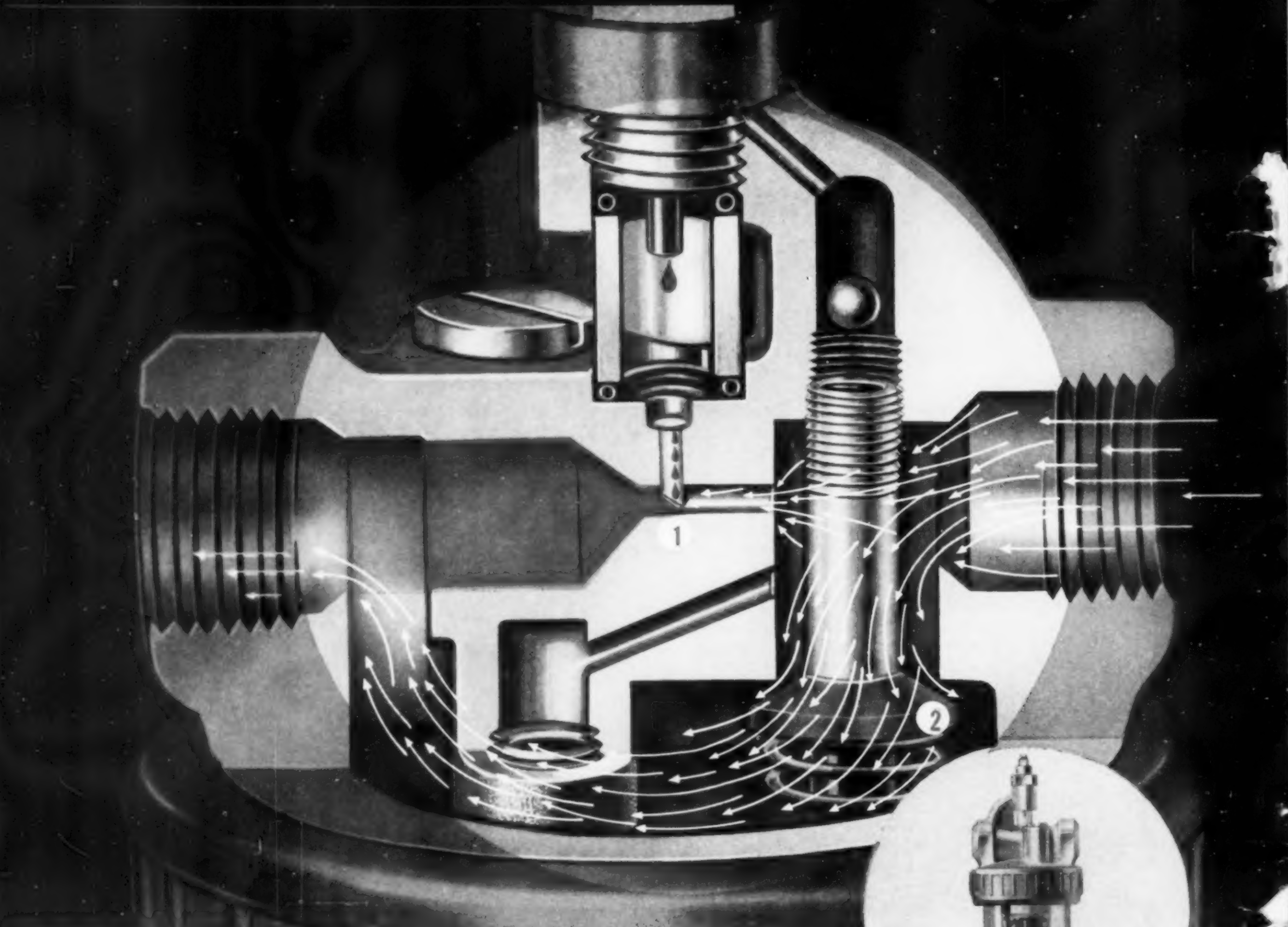
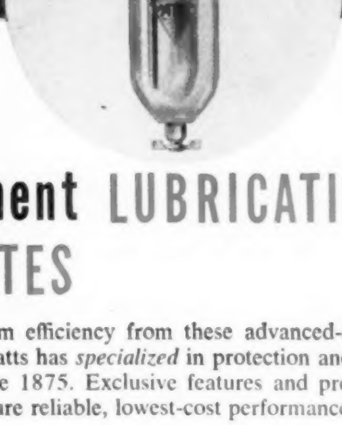
THIS MONTH'S COVER

Thousands of tool engineers will head for Philadelphia for ASTE's 26th Annual Meeting and Tool Show (May 1-8). Cover artist William Solms has chosen to symbolize the two events with banners representing the various branches of tool engineering that will be on parade.

The Tool Engineer is regularly indexed in the *Engineering Index Service* and *Industrial Arts Index*.





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Editorial & Business Offices
10700 Puritan Ave.
Detroit 38, Mich.

Publication Office:
239 E. Chicago St.
Milwaukee, Wis.

THE TOOL ENGINEER is published monthly in the interest of members of the American Society of Tool Engineers. Entered as second class matter, November 4, 1947, at the post office at Milwaukee, Wisconsin, under the Act of March 3, 1879. Yearly subscription: members $2.00; nonmembers, $6.00; Canada, $6.50, and all other countries, $8.00.

Tooling for Competition

Theme for the forthcoming Tool Show and Annual Meeting of the American Society of Tool Engineers is: Tooling for Competition. Reduced production schedules are, at present, the rule in the shop rather than the exception. During such periods as this, meeting competition becomes an important factor for survival.

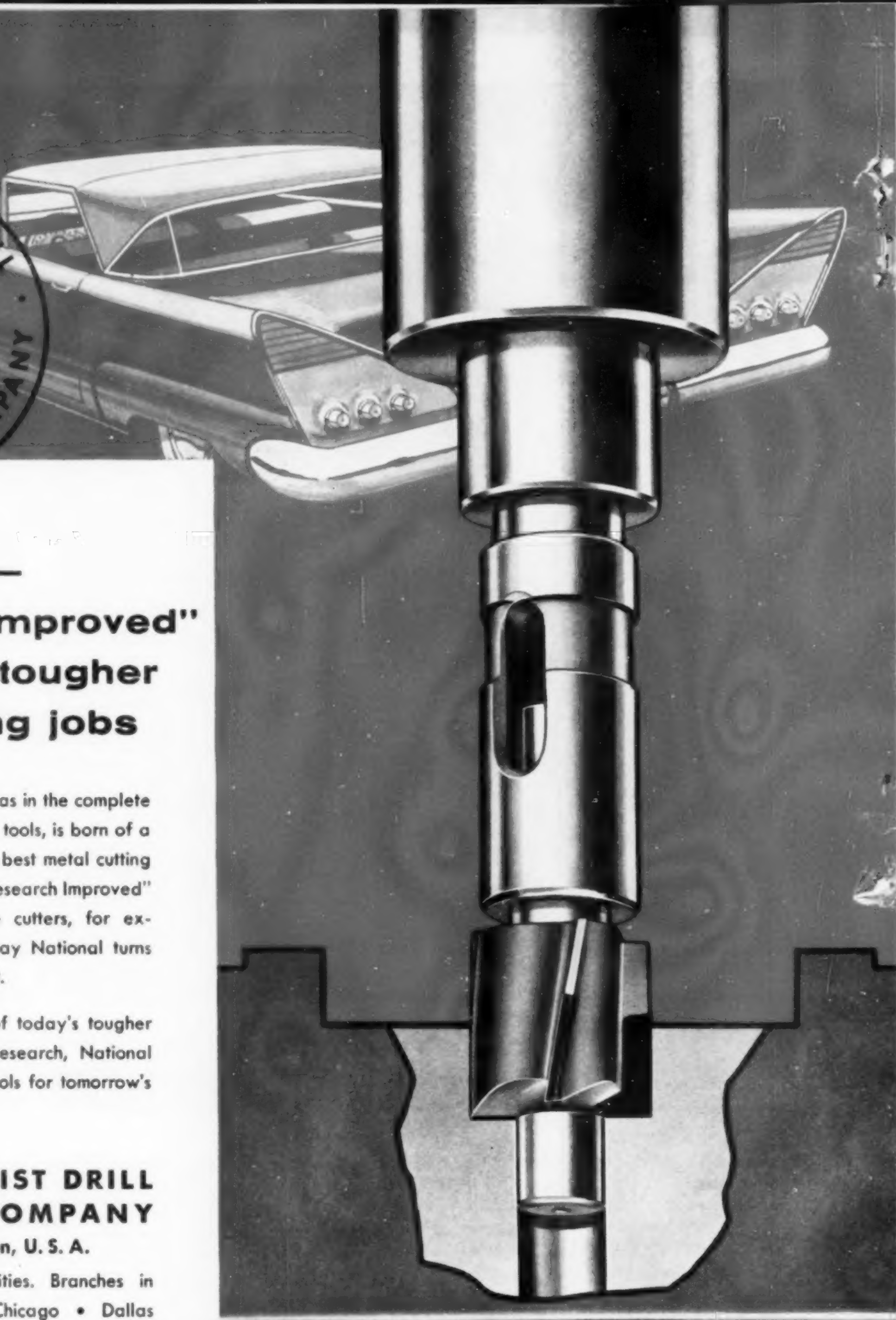
In heralding the forthcoming events in Philadelphia, this issue of THE TOOL ENGINEER has been dedicated to the show theme. These pages contain the program of all the scheduled events together with a preview of the Tool Show, making it virtually a show in print. In addition, several papers for presentation and discussion at the technical sessions are abstracted to indicate the quality and caliber of these meetings.

Currently, some plants are adopting the policy of "wait and see" how things will look later. This short-term policy can parlay cut backs into becoming more serious. In fact, it could even snowball into a dangerous economic recession.

Fortunately, many machine tool and other production equipment builders are introducing new and improved models at this time.

American industry has never profited by a wait and see attitude. Working not waiting, action not inaction are required to put the show on the road. Tooling for competition today with faith in the future is the greatest stimulus to a more productive economy. This faith in ourselves is one of the secret weapons that has made America great!

John W Greve
EDITOR



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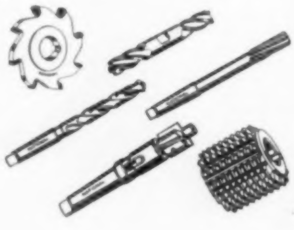

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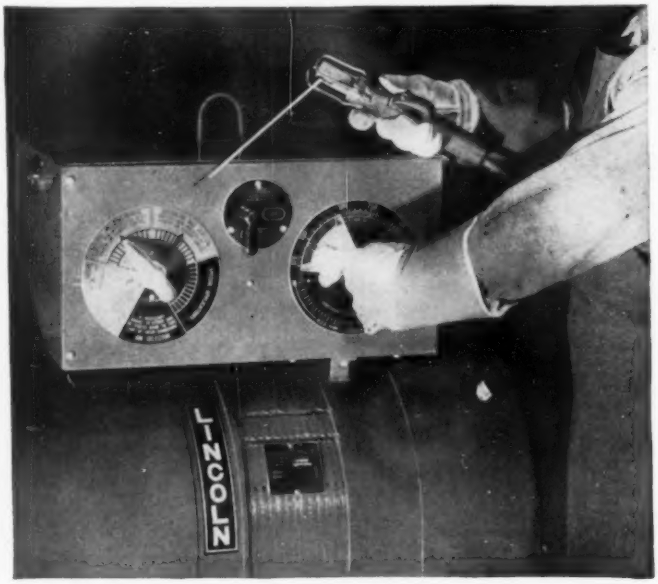

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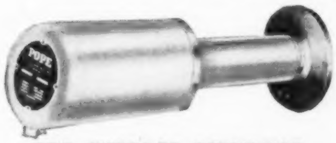

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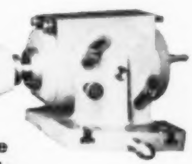

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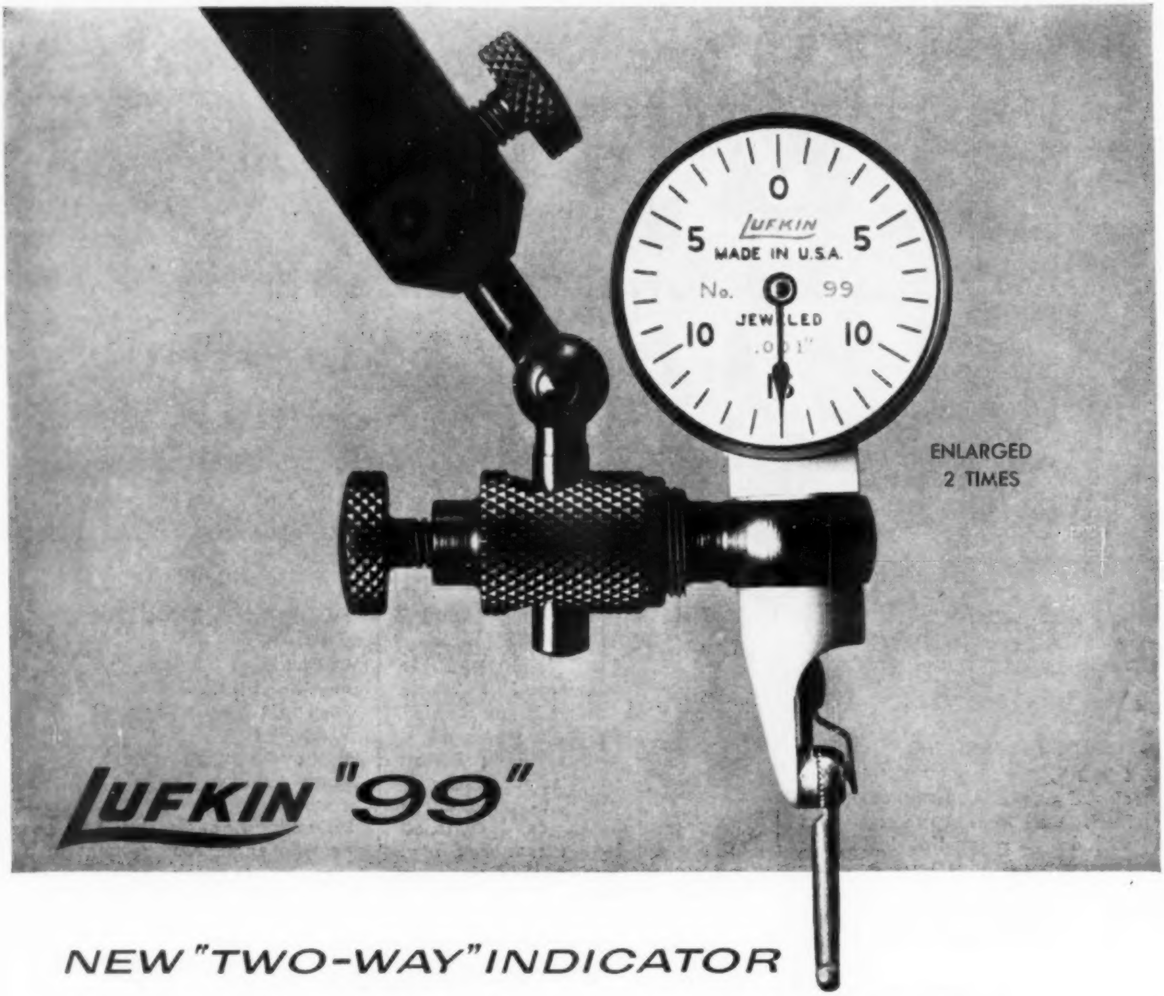

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SINGLE RAM VERTICAL

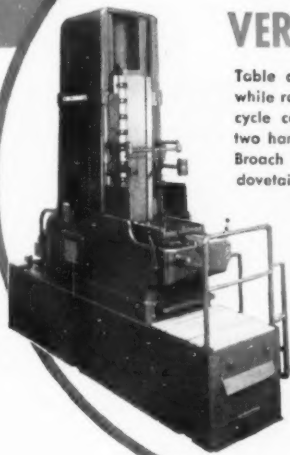

Table automatically recedes for loading while ram returns to top of stroke. Pre-set cycle control, a safety feature, requires two hands to start or initiate next cycle. Broach holders clamped against solid dovetail locating side for convenience in setting up the job. Table designed to accommodate interchange of fixtures. Ram and table ways hardened and ground, and automatically lubricated.

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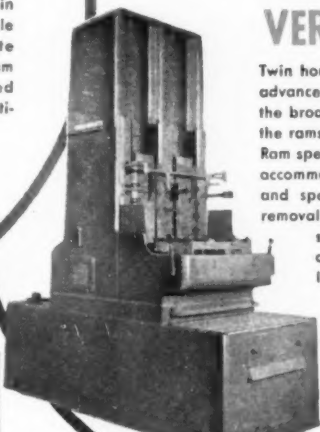
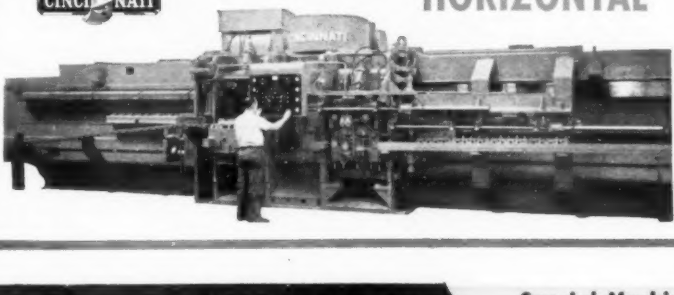


Twin horizontal tables automatically advance and recede in phase with the broaching and return strokes of the rams. Broaching cycles alternate. Ram speeds are infinitely variable to accommodate various work materials and speed of operator. Easy chip removal from front of machine. Pre-set cycle control protects the operator. Automatic pressure lubrication of hardened and ground ways.

Specifications

Style	Tons broaching force x stroke	Main Drive	Catalog No.
Single Ram Vertical, 11 sizes	No. 1-30 to 25-66	3 to 50 hp	M-1745-1
Duplex Vertical, 11 sizes	No. 1-30 to 25-66	3 to 50 hp	M-1848-1
Horizontal, Std. 6 sizes Semi-standard	No. 10-66 to 25-84 up to No. 100-312	40 to 90 hp up to 600 hp	M-1910

HORIZONTAL



Standard sizes are available in one-way and two-way broaching cycles, and horizontally or vertically hinged tables. Fixtures swing away from the machine for safety in work handling. Convenient height for conveyor lines. Larger sizes, for broaching cylinder blocks and heads, and other large parts, are semi-standard. These machines are equipped for the job. Hydraulic or electro-mechanical drive to ram.

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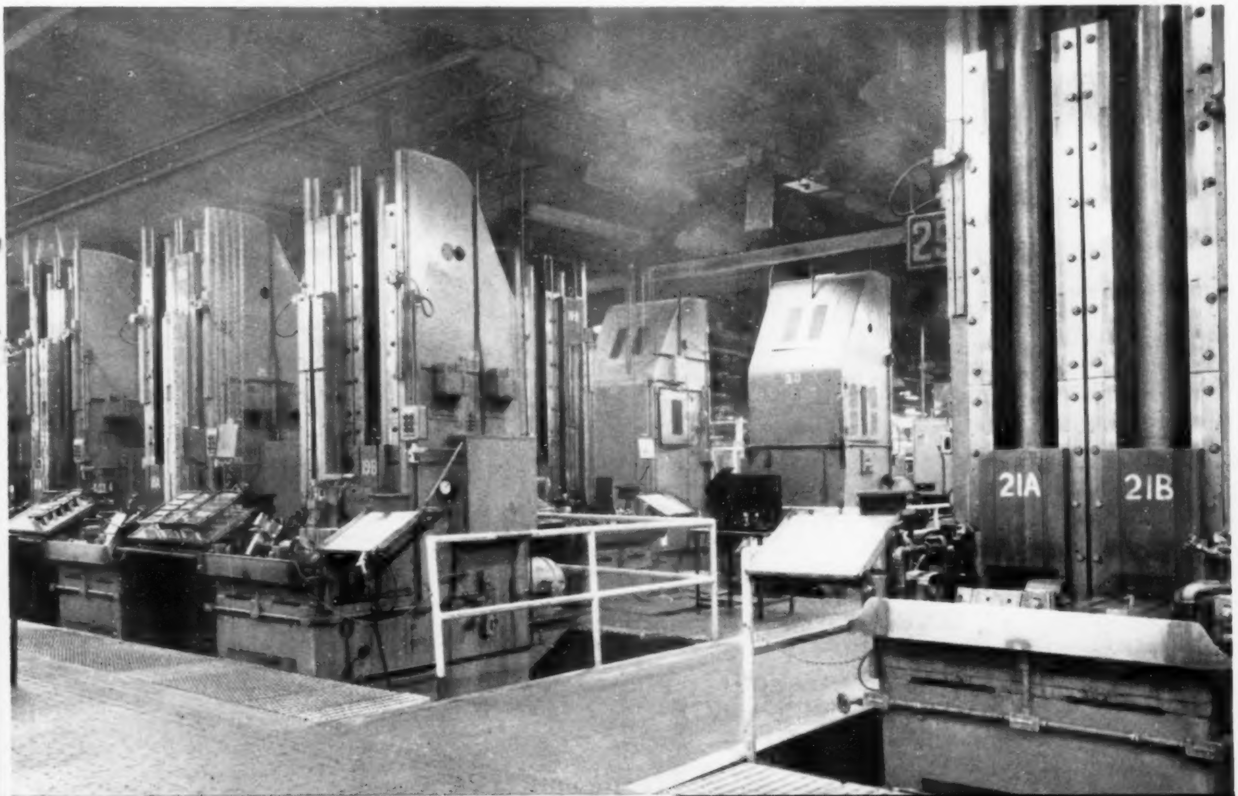

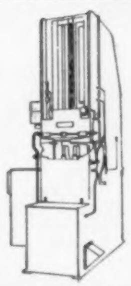

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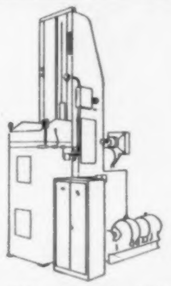

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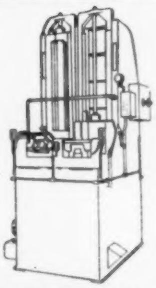

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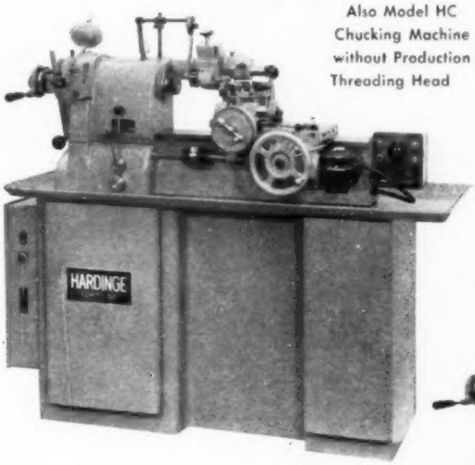
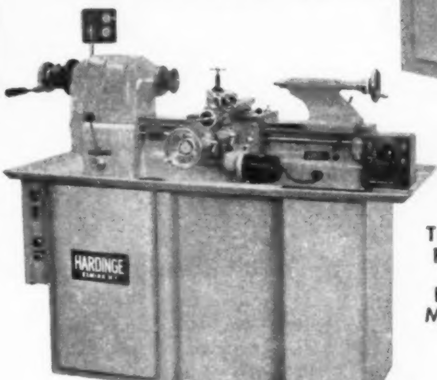


HARDINGE Model DSM 59
Second Operation Machine

HARDINGE Model TFB



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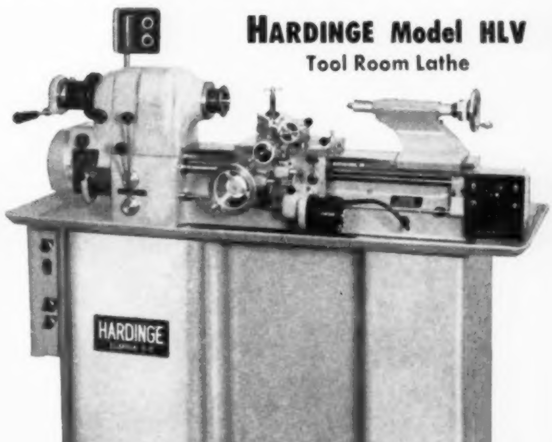

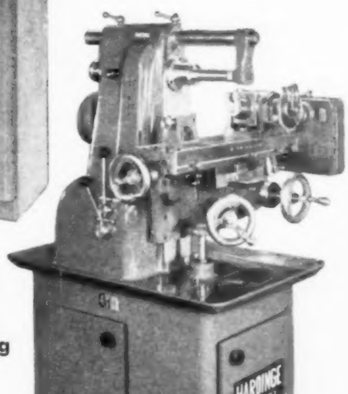

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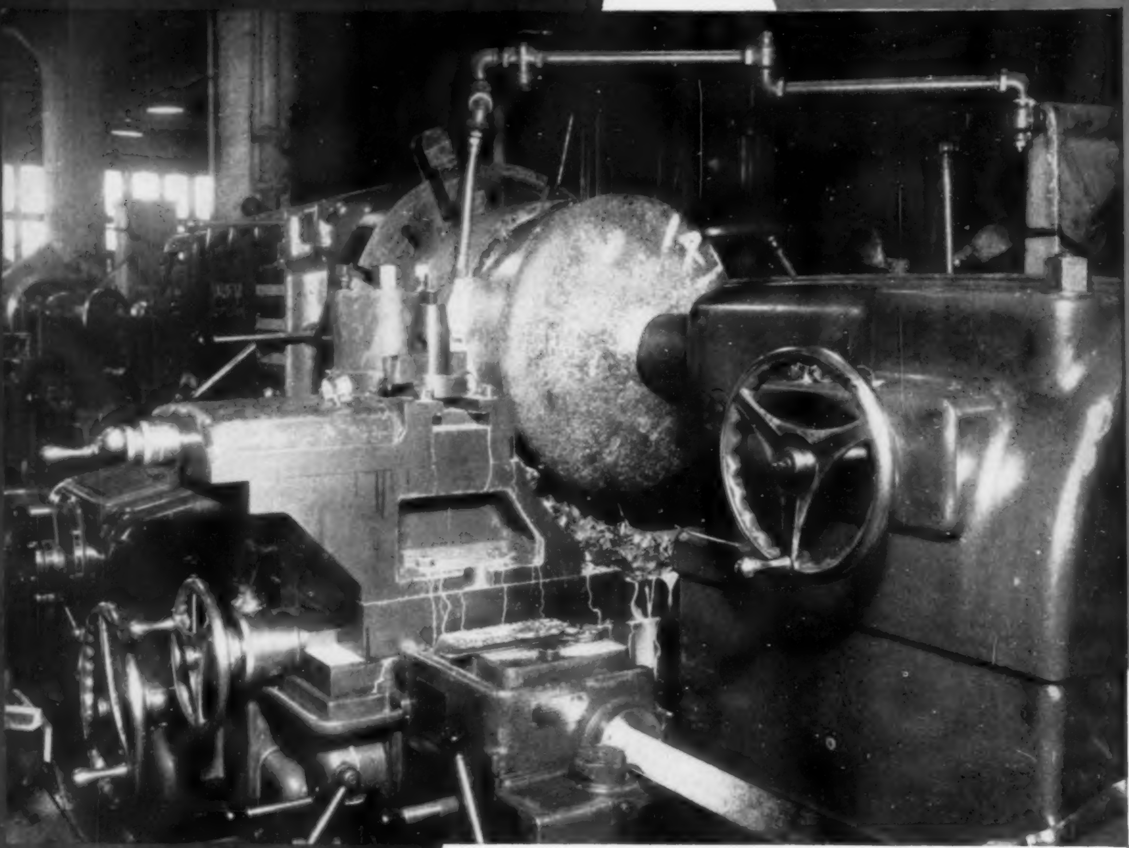

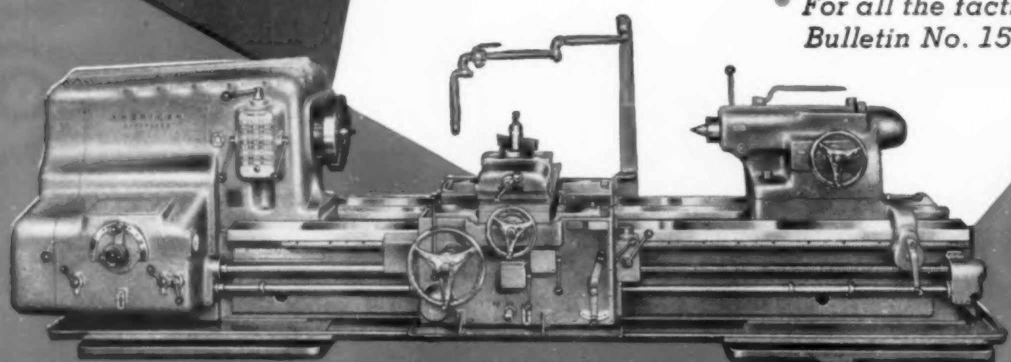

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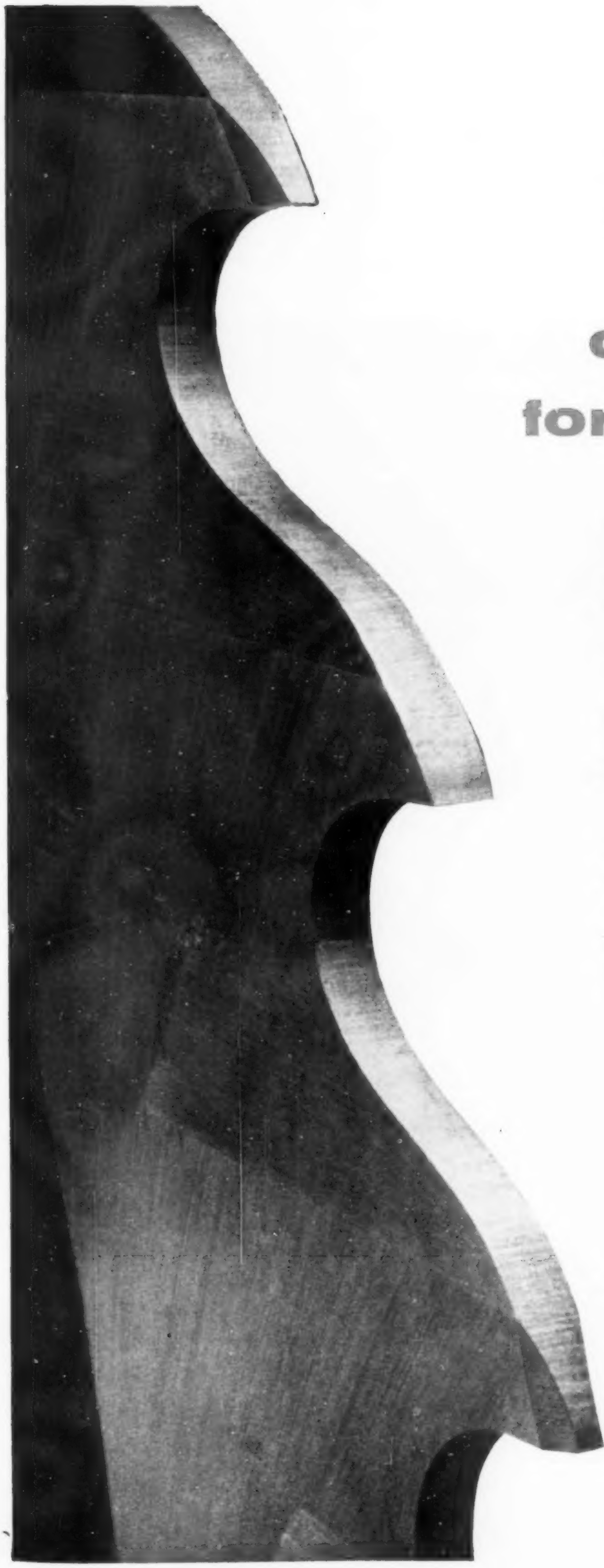

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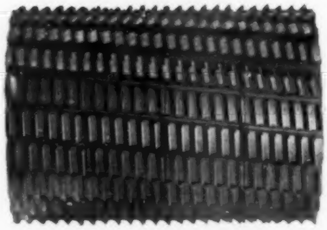

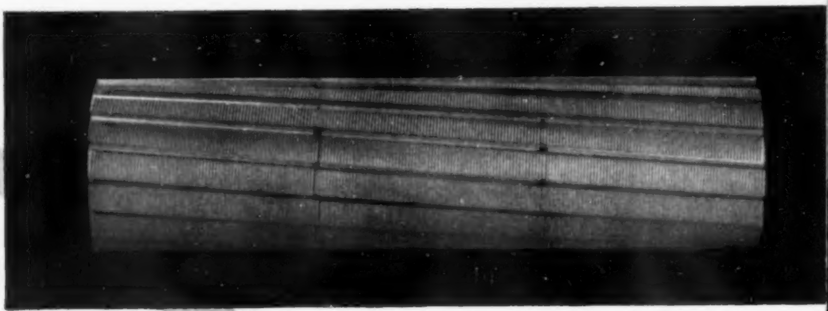

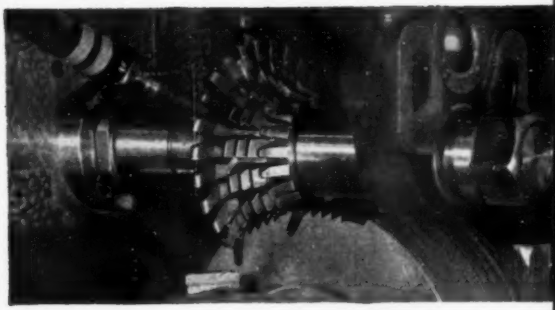

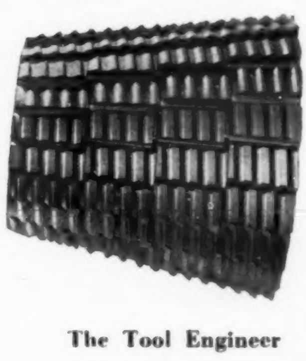

Reduce tool costs, save set-up, sharpening time

Barber-Colman Cutter Engineers have introduced new design features in special form-relieved cutters for milling saw blades which improve quality of the saws, and reduce production costs. These features also help to reduce initial tool cost.

Whenever possible, Barber-Colman Cutter Engineers recommend wide sections in these interlocking cutters. Wide sections often result in lower initial cutter cost than narrow sections. Since each section of the cutter must be sharpened in relation to the other sections, fewer sections result in less sharpening time. Handling and set-up time is also reduced. Our manufacturing facilities allow us to make these wide sections and still maintain the required accuracy.

Many saw blade cutters are furnished with helical flutes which produce a continuous shearing cut and distribute the cutting load evenly. Straight-fluted cutters can be made with the flutes staggered from section to section. For saw blades which require positive rake on the teeth, we can furnish tapered cutters with straight flutes which are staggered from section to section as shown in the example.

Cutter accuracy assures correct saw teeth

Since all saw blade teeth must be the same height so that each tooth will cut its share of the load, the cutters must produce sharp points of even height. Alternate tooth cutter design allows sharp points to be produced on the saw teeth. The relative position of the cutter teeth, both radially and axially, is held accurately from flute-to-flute. In addition, the cutter is accurate with respect to pitch and radial and axial runout. This inherent accuracy will be maintained throughout the life of the cutter with proper attention to accurate index sharpening.

The cutters shown here are typical examples of saw blade cutters. They can be furnished for hack saw, band saw or circular saw blades with either radial or rake teeth. Barber-Colman Engineers can design other types of special form-relieved cutters to solve your milling problems. Send blueprints of your part for analysis and recommendations.

See these cutters in BOOTH 1255

Barber-Colman saw blade cutters will be on display at the ASTE Show in Booth 1255. Be sure to see these improved design features, as well as other Barber-Colman cutter developments, including the New Mult-O Tools for transfer-type machining.

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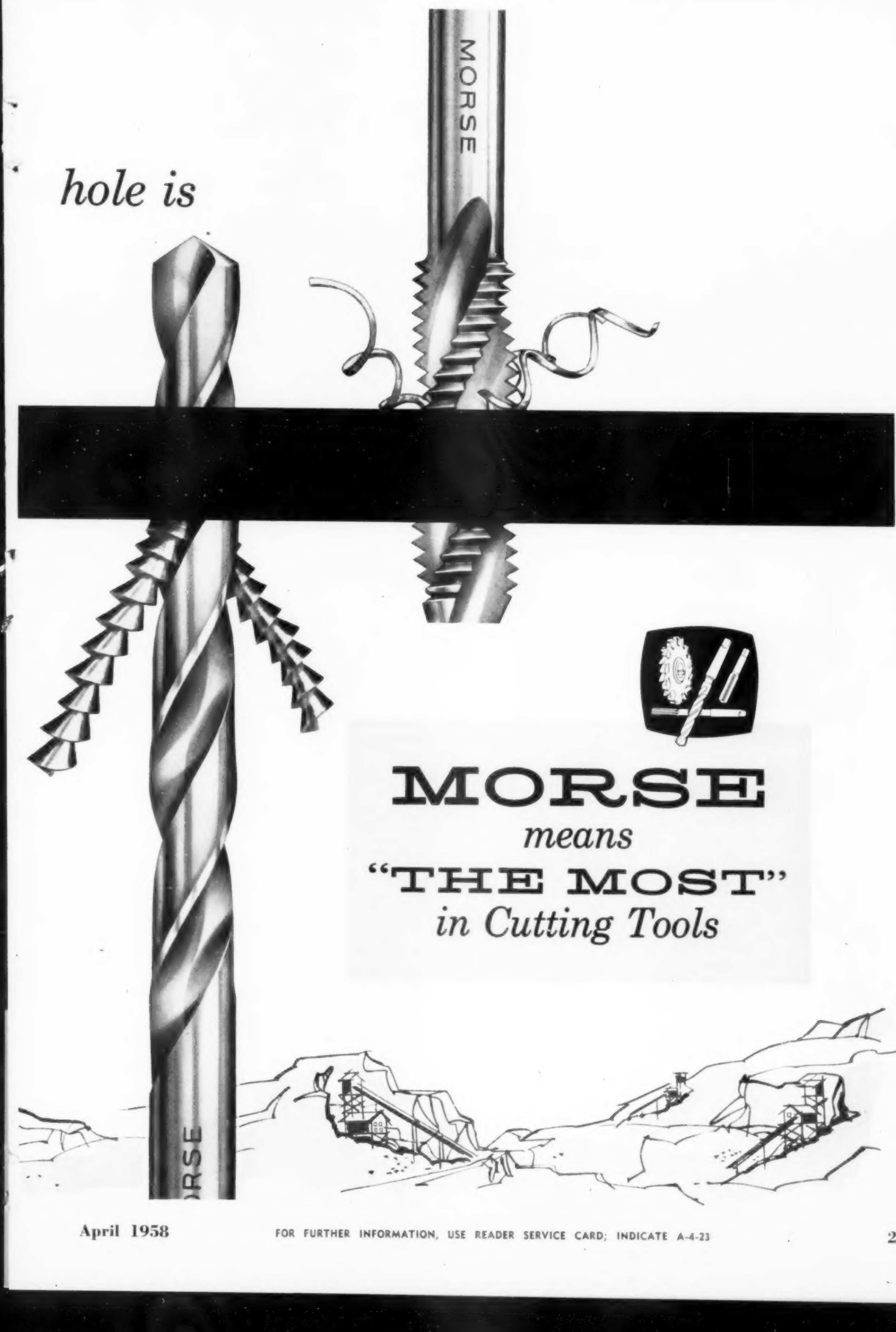

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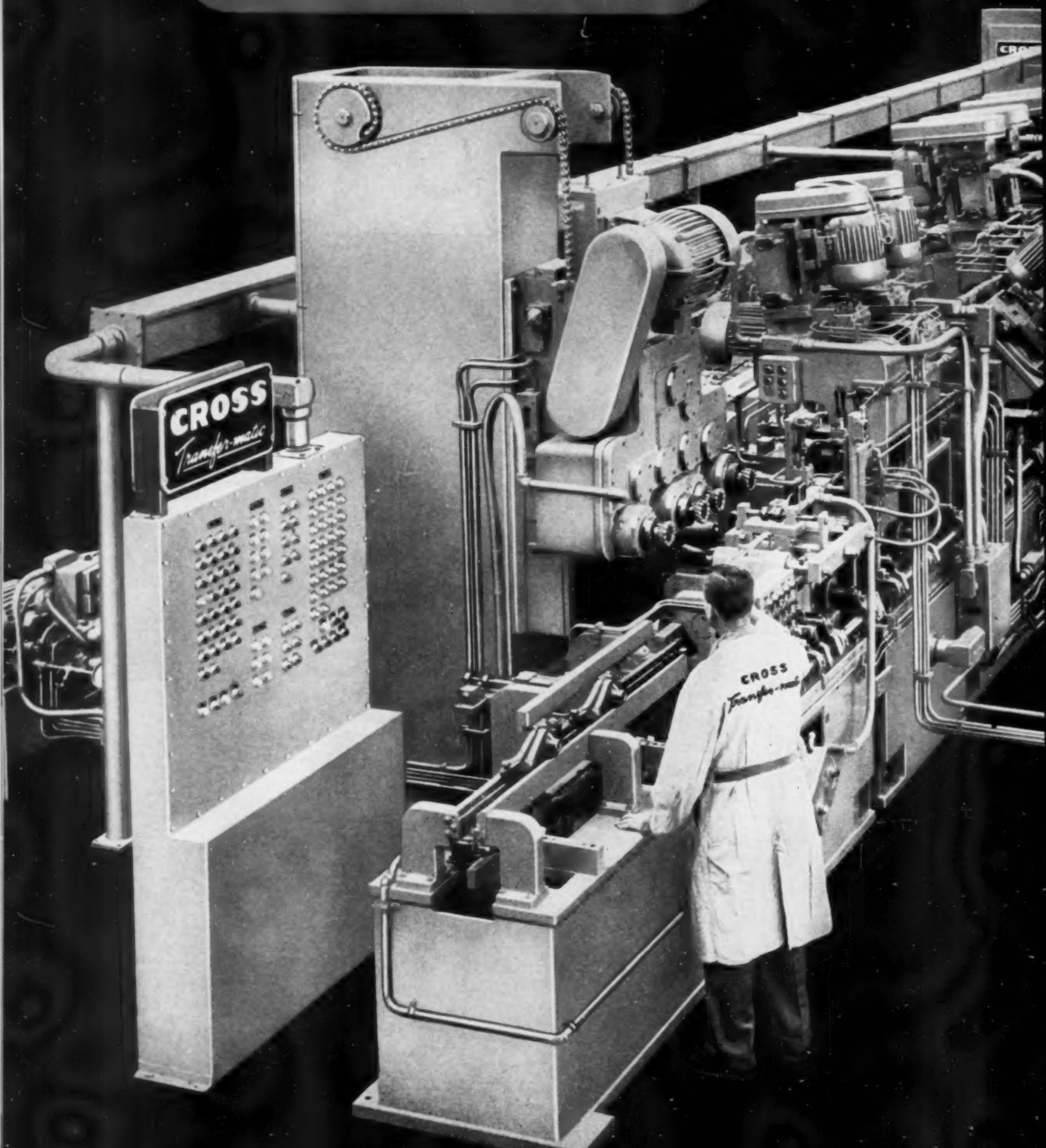
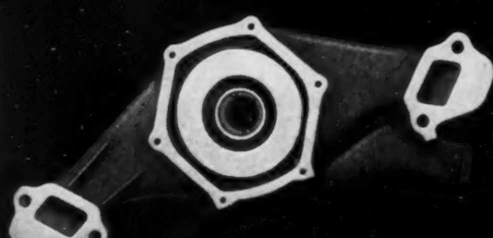
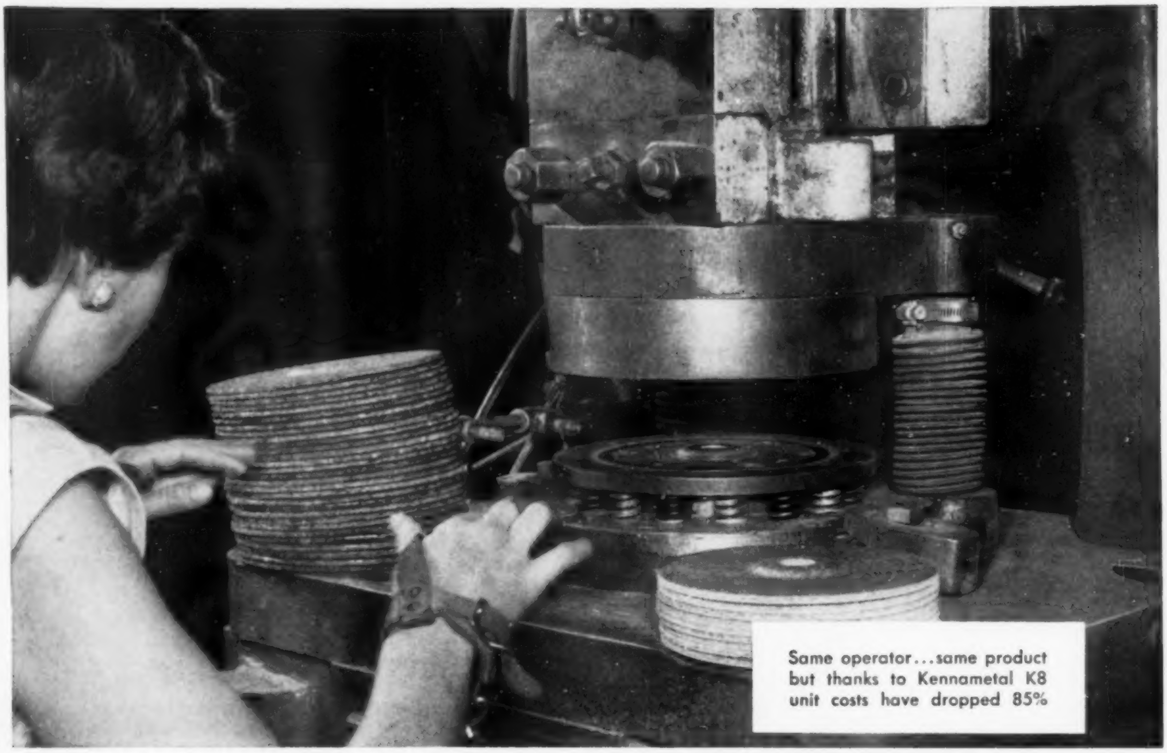
Complete Machining of Water Pump Bodies







Same operator...same product but thanks to Kennametal K8 unit costs have dropped 85%

With KENNAMETAL* Die Grade K8 . . .

Cost of MX® Abrasive Wheels dropped 2.64 cents per unit

Accurately kept production records of The Carborundum Company show that one set of Kennametal Grade K8 punches and die rings outlast *six* sets made from high speed steel. Cost of the punch and die rings, plus setup time and die regrinding time formerly added 3.1 cents per unit. By the introduction of Kennametal Grade K8 punch and die rings, this cost has now dropped to less than one-half cent per unit.

In addition to reducing your unit costs through extended die life and low maintenance, Kennametal Die Grades bring you additional benefits through their ability to hold close tolerances for greater product uniformity.

Why not find out what Kennametal can do for the critical wear parts of your operation. A Kennametal Die Engineer will gladly work with you in selecting and applying the Kennametal Grade that best meets your requirements. Get more information on the six grades of Kennametal's "90" series or the three exclusive, non-galling "80" series . . . a total of nine Die Grades developed to meet every die need, including yours. Call your Kennametal Representative, or write KENNAMETAL INC., Latrobe, Penna.

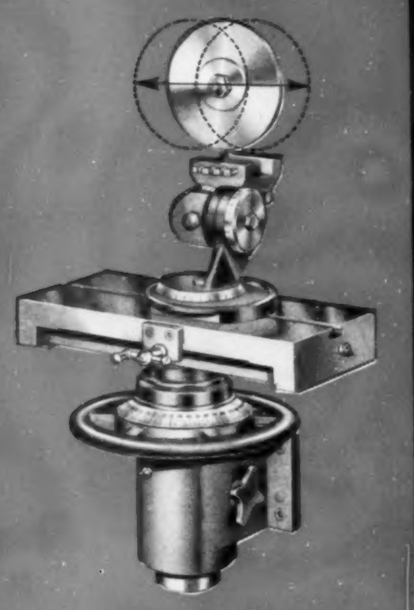
*Trademark

3102

Disassembled die used for blanking and piercing arbor holes in Carborundum's MX abrasive wheels. Kennametal Die Grade K8 is now used for both the piercing punch and the punch ring that form the outer diameter of the wheel.

INDUSTRY AND
KENNAMETAL
...Partners in Progress

XLO EX-CELL-O FOR PRECISION



CHIP-BREAKER ASSEMBLY: On the opposite end, mounted under the reciprocating chip-breaker wheel is the chip-breaker table with vertical adjustments. It accommodates adjustable tool block fixture which holds tool in place while grinding chip-breaker groove at desired angle.

TWO MODELS AVAILABLE; Style 142 for conventional grinding with vitrified or diamond wheels; Style 264, equipped with metal-bonded diamond wheels, for *electrolytic* grinding.

new DUAL PURPOSE RECIPROCATING TOOL GRINDER

Ex-Cell-O takes all the work out of both conventional and chip-breaker tool grinding

Now an entirely new reciprocating double end tool grinder designed by Ex-Cell-O to do two jobs in one—conventional grinding on one end, chip-breaker grinding on the other—has now been added to Ex-Cell-O's line of conventional, double end, carbide and Method X tool grinders. The difference is the adjustable, power-controlled reciprocation of grinding wheels. The operator need only hold the tool at the pre-set angle.

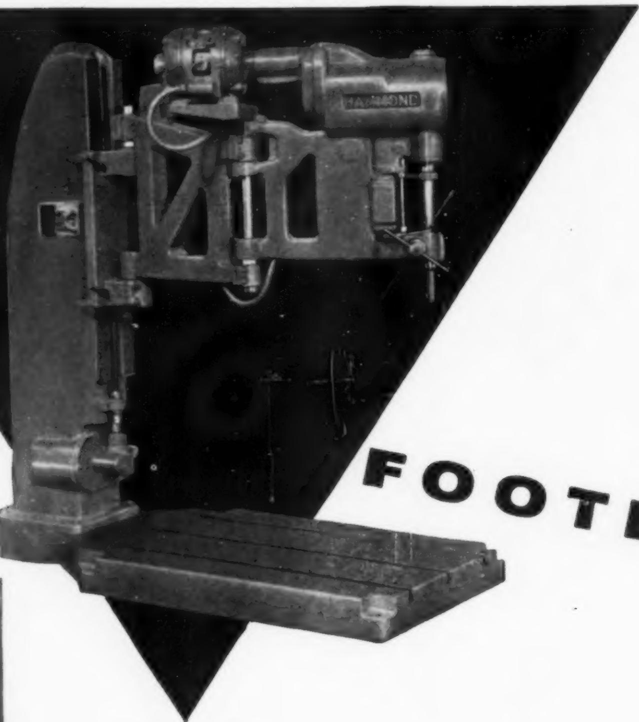
Other features of this new grinder include: variable stroke (0 to 1½"); variable number of reciprocations (0 to 220 strokes per min.); in-built motorized precision grinding spindle, saddle-mounted to reciprocate along hardened and ground bars which are mounted on pre-loaded ball bushings. You'll want to see for yourself the capabilities of this new Ex-Cell-O—to do so, simply contact your local Ex-Cell-O Representative. Or, if you wish, write direct to Ex-Cell-O, Detroit. Ask for Bulletin 461872.

EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN

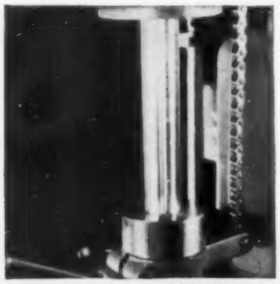
Machinery Division

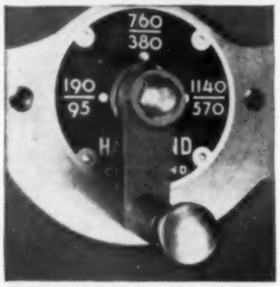
MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING AND BORING SPINDLES • CUTTING TOOLS • TORQUE ACTUATORS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

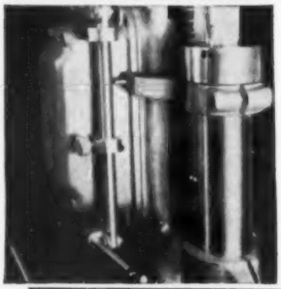
57-25



FOOTBURT







for Faster radial drilling and tapping

Hammond Radial Drilling and Tapping Machines may be spotted in the production line for drilling, tapping or reaming. With its unique Bracket Type construction the spindle can be swung quickly from hole to hole. Six Quick Speed Changes are instantly available and the Hammond Tapping Reverse is very fast and convenient to operate.

THE FOOTE-BURT COMPANY • Cleveland 8, Ohio

Detroit Office: 24632 Northwestern Highway, Detroit 35, Mich.

Write for Circular #7A.

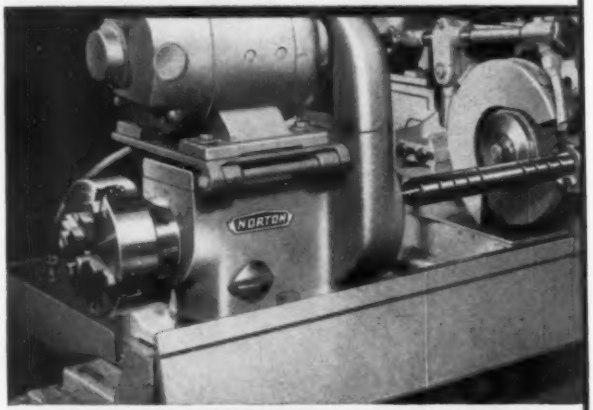
ENGINEERED FOR PRODUCTION

FOOTBURT

MACHINE TOOLS

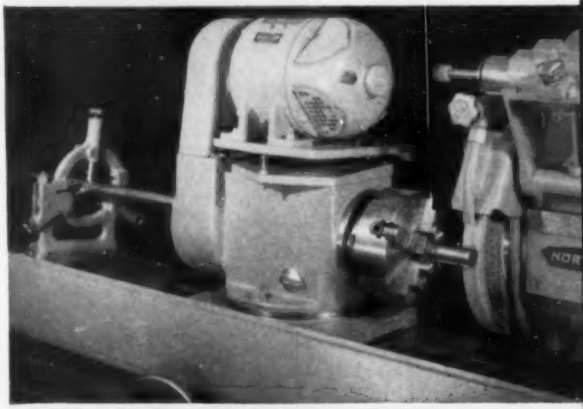
Norton builds extra versatility into universal grinders...

JOB-SPEEDING FEATURES

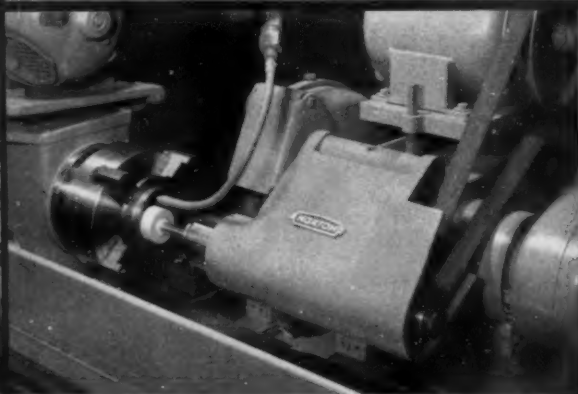


Minimum effort to change from dead center to chucking work. Chuck may remain mounted at back end of headstock while dead-center grinding.

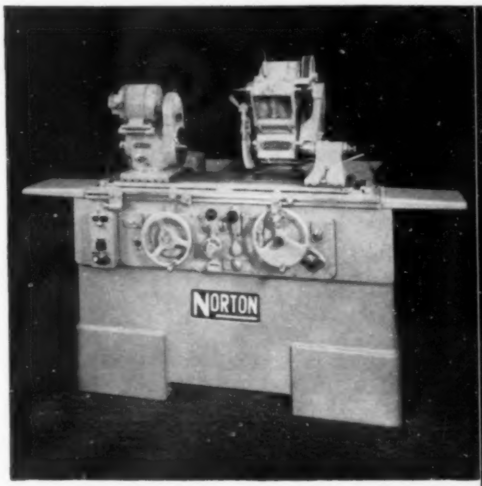
to put <u>extra</u> dollars in your pocket



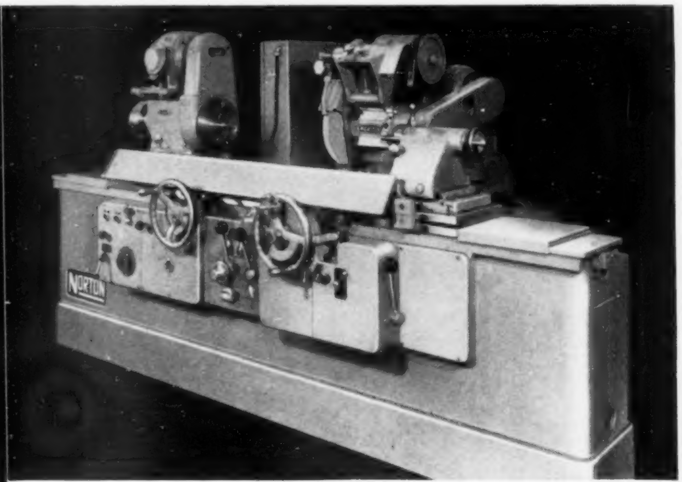
Hollow headstock spindle gives you additional capacity for grinding long bars by passing them clear through and supporting them in grinding position.



Hinged-bracket type internal grinding spindle swings up and out of the way when not in use. This means quicker setups for your I.D. or O.D. grinding.



Norton 10″ universal grinder. Made with 20″ or 24″ nominal lengths between centers. Catalog 170.



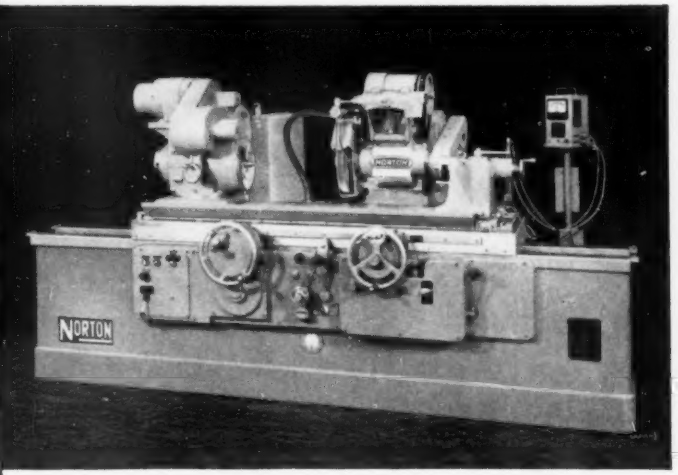
Norton 12″ Type U-4 universal grinder. Made with 36″ or 48″ nominal lengths between centers. Catalog 231.

Many a user rates his Norton universal grinder as a practically "complete grinding department." Why? Because Norton builds extra versatility into its universals for faster external, internal, face, taper and angular wheel-side grinding, including many special jobs. Also they're built with many famous job-speeding, cost-cutting features: For example:

Extremely rapid chucking . . . quick change-over to live or dead spindle operation . . . easy work speed changes . . . independent wheel settings that do difficult jobs fast . . . extra capacities on wheel head and headstock . . . precise swivel table alignment with the SWIVALIGN *Dual Electric Indicator, an optional extra.*

Made In The Size You Need

Norton universal grinders are made in 10″, 12″, 14″ and 18″ swing capacities. That means you can get exactly the size to bring you many time-and-money-saving "Touch of Gold" advantages. For complete facts on these high-efficiency machines see your Norton representative or write us direct. And remember: Only Norton offers you such long experience in both grinding machines and grinding wheels to help you produce more at lower cost. NORTON COMPANY, Machine Division, Worcester 6, Massachusetts.



Norton 14″ Type U-4 universal grinder. Made with 36″, 48″ or 72″ nominal lengths between centers and also in 18″ swing capacity. SWIVALIGN* Dual Electric Indicator, at right of picture, measures swivel table adjustments and is optional on all Norton universal grinders. Catalog 819.

To Economize, Modernize with NEW

NORTON

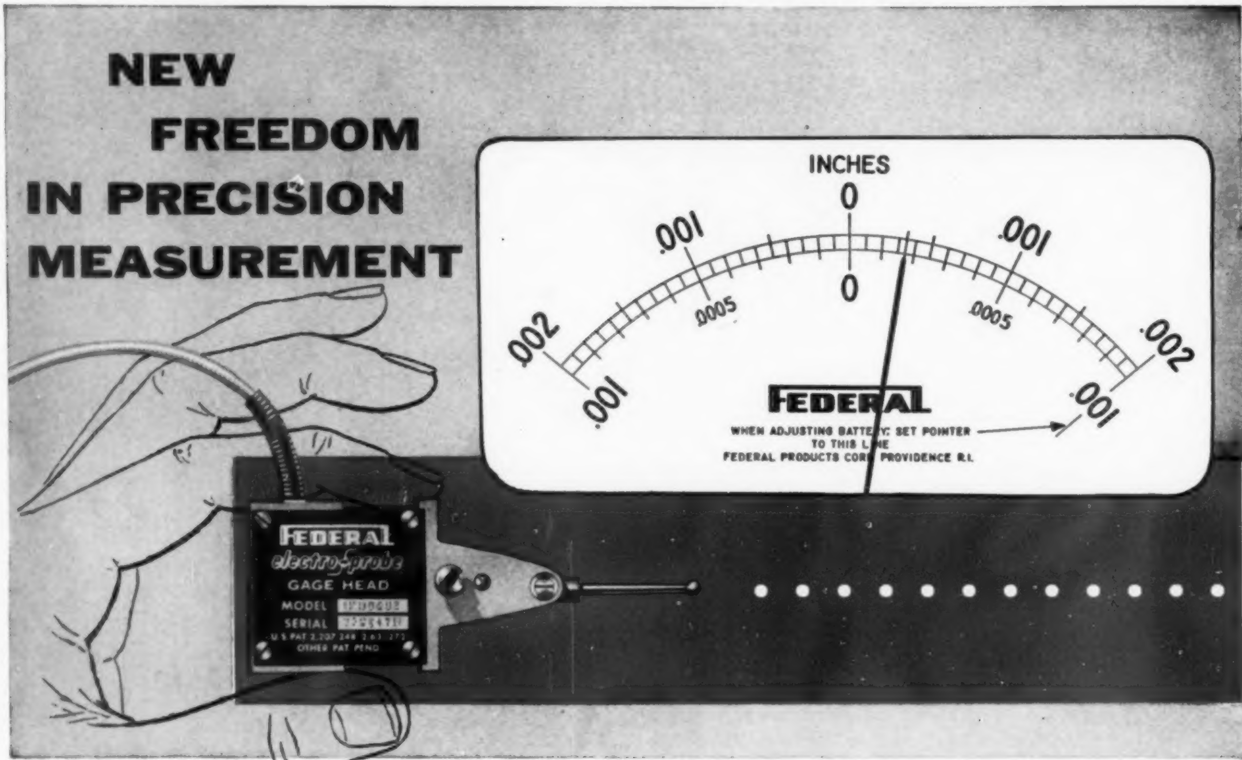
GRINDERS and LAPPERS

Making better products . . . to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING PRODUCTS: Coated Abrasives • Sharpening Stones • Behr-cat Tapes

District Offices: Worcester • Hartford • Cleveland • Chicago • Detroit
In Canada: J. H. Ryder Machinery Co., Ltd., Toronto 5

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries



New, Lower Cost Method of Electronic Gaging Promises New Horizons in Dimensional Control

as a system of measurement

The Electro-Probe system is one of far reaching capabilities . . . the gaging signal maintains exact linear relationship to contact movement — so exact, in fact, that available electrical instruments have not had sufficient sensitivity to measure the error. And this precision is available over the exceptionally wide range of .060". Mechanical and electrical sensitivity of the Electro-Probe is capable of providing magnifications and accuracies which will more than meet even *tomorrow's* precision gaging requirements. Small size and extremely light gaging pressure enable the gage head to reach and explore hitherto inaccessible surfaces. Hermetic sealing also allows you to use the Electro-Probe under conditions where electronic gaging has previously been impractical. Thus, the Electro-Probe has a challenging reserve of capability awaiting the need and means for its use. Perhaps you have an application that needs the Electro-Probe's advantages. We'll be glad to discuss it with you.

as a precision instrument

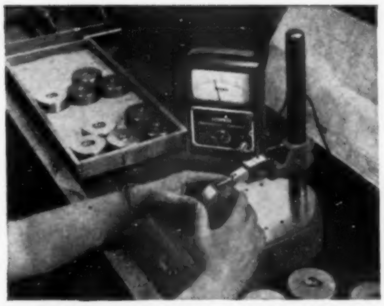
The first publicly announced application of the Electro-Probe system is the Model 230 P-2 Electronic Test Indicator described on the facing page. It is far more than just another electronic test indicator. No need for special stands or holding fixtures. No need for external power. No voltage fluctuation or warm-up problems. No need for close gage head positioning during set-up. The Electro-Probe frees you from these and other restrictions of use — truly provides you with a new freedom in precision measurement.

Ask FEDERAL First

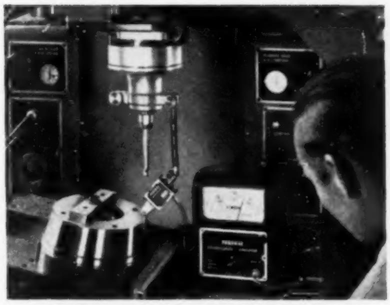
FOR RECOMMENDATIONS IN MODERN GAGES . . .

Dial Indicating, Air, Electric, or Electronic — for Inspecting, Measuring, Sorting, or Automation Gaging

Surface Plate — Electro-Probe can be used accurately with any type of conventional test set.



Bench — Use the Electro-Probe on any suitable comparator.



Machine — The light contact pressure of the Electro-Probe makes machine set-ups easier and faster.

the electro-probe

1. TAKE IT ANYWHERE — The Model 230 P-2 Electro-Probe, a part of the new Electro-Probe System, is a completely portable, self-contained unit consisting of a bantam size electronic gage head and transistor amplifier which together with metal carrying case and accessories weighs only 8½ lbs. It is completely independent of external power. Gage head and output cord are impervious to oil and water in any amount (electrical parts are hermetically sealed).

2. MOUNT IT ON ANY CONVENTIONAL FIXTURE — The Electro-Probe gages accurately without requiring a special stand or holding fixture because it has the lightest positive gaging pressure (less than 5 grams). Posts and arms which would deflect even under normally light gaging pressures remain rigid when the Electro-Probe is used. And unlike other precision instruments, gaging pressure is constant throughout range (change is less than 0.1 gram per .001").

3. SET IT UP IN A JIFFY — The Electro-Probe gives you precision *without* the penalty of time-consuming, finicky adjustments. Master it anywhere within its range because Electro-Probe response is absolutely linear. Full scale Zero Adjustment makes positioning easy and fast. Also — unlike any other electrical gaging device, warm up time is virtually zero. Gage the part when *you're* ready, turn it on and off, as you like, without penalty.

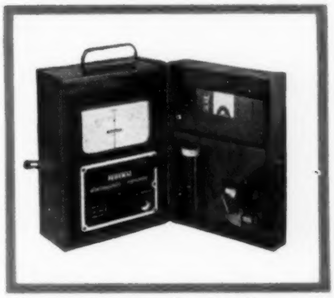
4. GAGE WITH EASE AND ASSURANCE — The Electro-Probe contact has friction-free travel of .060". It is clutch mounted so you can place head in almost any position — as well as to provide *complete* over-travel protection. Either of two magnifications instantly available by switching. Wide 4½" dial provides comfortably spaced, easy-to-read graduations. Knife-edged pointer permits sharply defined readings.

5. ENJOY GREATER RELIABILITY THAN EVER BEFORE — Use of printed circuits and transistors in Electro-Probe Amplifier means truly trouble-free operation. Connections are sure, operating current amazingly low, — no heating or voltage regulation problems, no dependence on electrical outlets. Learn more about this truly portable, reliable, accurate and versatile gaging device that gives you precision without the restrictions that precision has up to now imposed.

Write for literature

Federal Products Corporation, 8194 Eddy Street, Providence 1, R. I.

Packaged for Convenience



Electro-Probe gage head, self-powered amplifier, and accessories, all in one lightweight case.

. . . easily carried from job to job.

See how optical gaging solves 4 basic inspection problems faster... at less cost

(1)
RECEIVING: With optical gaging you get *immediate* checks on tolerance for incoming precision parts. One glance tells whether parts are to your specification. For example:

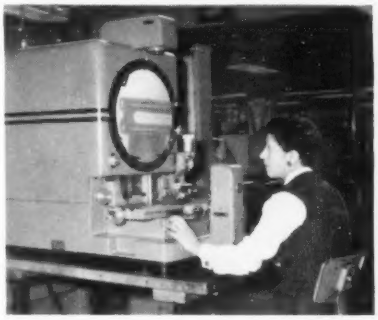
Inspectors at the *Allen-Bradley Company*, makers of electrical equipment, use Kodak Contour Projectors for fast, accurate inspection of incoming precision parts. They check *more than 400 different items*, most with multiple dimensions, and sample size of 35 or more pieces. Tolerances are held to .001″. Since optical gaging permits checking several dimensions at once, Allen-Bradley has drastically cut inspection time. Parts are quickly cleared for production; quality control is better.

(2)
ASSEMBLY: Mass producing your product may require fast yet accurate inspection of precision component assemblies. Here's how one manufacturer solved the problem:

Magnetron Beam Switching Tube, produced by *Electronic Tube Division, Burroughs Corporation*, has 21 elements which fit into mica holding-wafers at top and bottom. The elements must be lined up to within .002″ of specifications. The problem was to do this complex inspection job *fast enough to keep up with assembly speed* in mass production. With a Kodak Contour Projector the inspector can easily match top assembly speeds while maintaining the required specifications.

(3)
FINAL INSPECTION: You can inspect a great variety of finished parts quickly with the Kodak Contour Projector—and cut costs, too.

In one instance, a great variety of component parts for various manufacturers posed a serious inspection problem for *Auburn Plastics, Inc.*, a custom molder. The firm formerly used mechanical gages in large numbers to make necessary quality control checks. A Kodak Contour Projector eliminated the expense of buying mechanical gages (savings amounted to $5,000 in one instance). Now operators can inspect at a glance finished components—gage angles, radii, holes, and other dimensions—with an accuracy that meets close tolerances.



(4)
PRODUCTION: Optical gaging gives you accurate, fast inspection of tools and dies during use in production.

For example, at *Stromberg-Carlson*, a Division of General Dynamics Corp., die life presented a complex gaging problem. Checking by conventional gaging methods was cumbersome, time-consuming, and inaccurate. Optical gaging of piece parts with a Kodak Contour Projector now provides a quick, accurate check of die wear during production. A typical example concerns a die which stamps out relay lever arms. The 35 dimensions of the lever arm are optically checked in 1/3 the time of other gaging methods.

Optical gaging with the Kodak Contour Projector saves time because you can check many dimensions at a glance. Saves you money, too, because one projector does a wide variety of gaging jobs. Changing from one type of part to another is a simple matter of changing your chart-gages on the screen and your fixtures.

Whatever your inspection or measuring problem may be, there's a Kodak Contour Projector to do the job—from the compact bench-type Model 8 to the big Model 30 with its 30-inch screen and large part capacity.

For additional details, send for the new illustrated booklet "Kodak Contour Projectors." Write to:

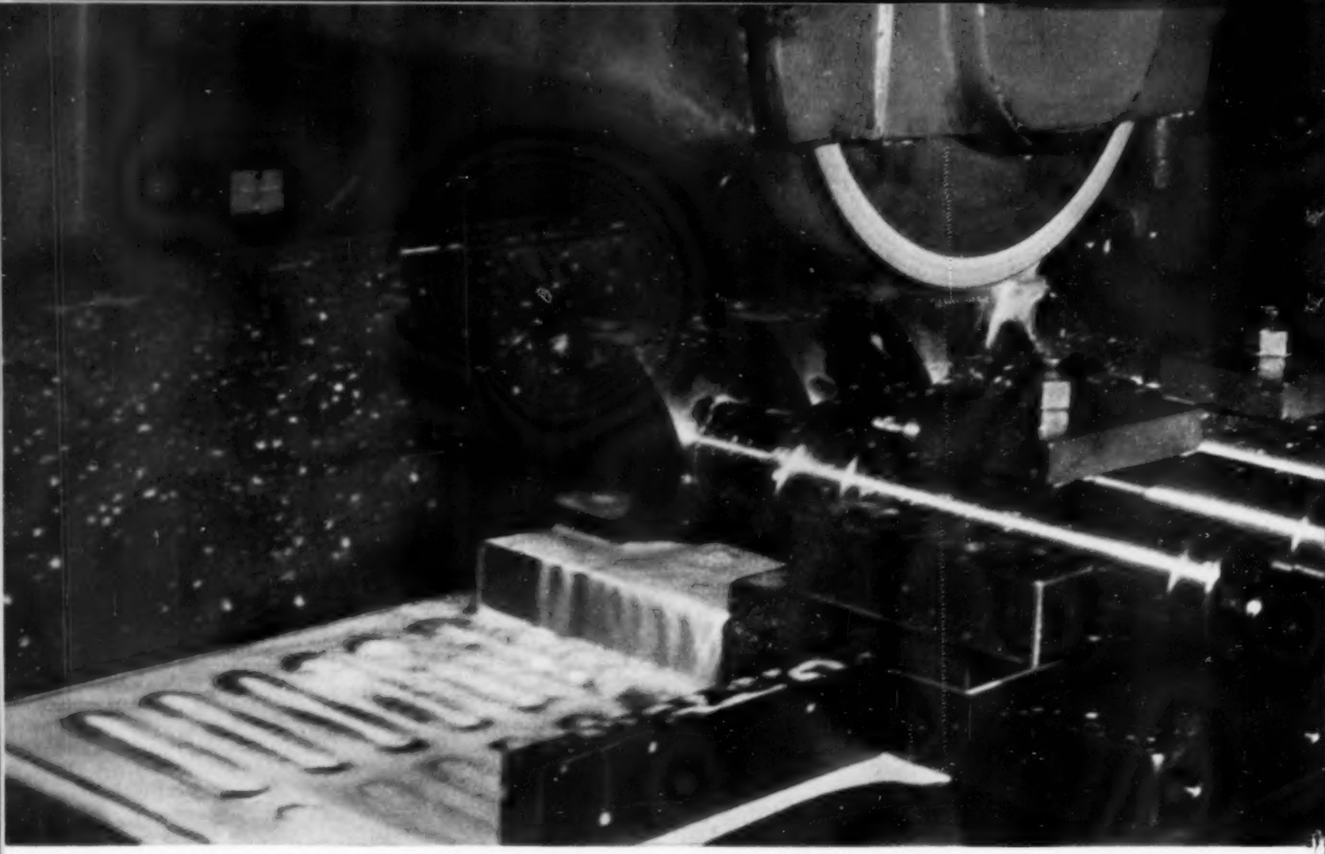
Apparatus and Optical Division

EASTMAN KODAK COMPANY, Rochester 4, N. Y.

the KODAK CONTOUR PROJECTOR

Kodak
TRADE MARK

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-4-35



Wheels and machines stay cleaner with emulsions of new S.E.C.O. Also, finishes are better.

Emulsions of new S.E.C.O. allow faster cuts with less tool wear.

Photos courtesy of
Peter Salmon Co., Glenside, Pa.

NEW EMULSIFYING OIL KEEPS MACHINES CLEAN, PROTECTS AGAINST RUST, GIVES IMPROVED HARD-WATER EMULSION STABILITY

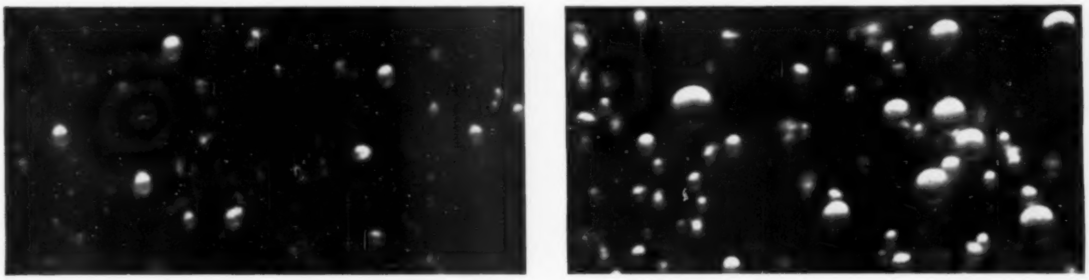
Emulsions of Sun's new S.E.C.O. (Sunoco® Emulsifying Cutting Oil) with smaller oil particle size give you the following benefits—

EMULSION STABILITY—In hard-water areas, impartial field tests show that emulsions of *new* S.E.C.O. stand up better under more severe conditions than those made with other regular emulsifying cutting oils.

DETERGENCY—The excellent wetting properties and detergency of *new* S.E.C.O. allow dirt and fines to settle quickly out of emulsions. Grinding wheels and machines stay cleaner.

RUST-PREVENTION—The smaller oil particle size in emulsions of *new* S.E.C.O. gives better metal wetting properties and increased protection against rust and corrosion. See photos below.

If you're a regular user of S.E.C.O., notice how much it has been improved. If you're not, find out what we mean about greater economy and improved production with *new* Sunoco Emulsifying Cutting Oil. Call your Sun representative, or write to Sun Oil Company, Philadelphia 3, Pa., Dept. I-9.



800x photomicrographs of 10% emulsions. *New* S.E.C.O. emulsion on left contains *8 times* as many oil particles per unit volume as ordinary emulsion on right. Many minute particles in S.E.C.O. emulsion do not show at this magnification.

SUNOCO ®

INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY Philadelphia 3, Pa.

IN CANADA: SUN OIL COMPANY LIMITED, TORONTO AND MONTREAL

To increase the output and efficiency of large presses the Ford Motor Company has installed a McKay Mechanical Press Feed Line that for the first time successfully cleans, levels, and feeds heavier materials for today's production requirements. Designed to process strip up to 60″ in width and 1/8″ in thickness, it works equally well on progressive die or blanking presses without overloading. And, because it is floor-mounted with independent drive it can easily be adapted to future production needs.

If you want to increase the efficiency of your press equipment, why not talk with McKay—pioneer and leading producer of press feed and cut up lines.

FREE BOOKLET

Complete illustrated data on McKay Press Feed and Cut Up Equipment will be mailed without charge at your request. Write for it today.

THE McKAY MACHINE COMPANY, Youngstown, Ohio

form INTERNAL THREADS

BESLY X-PRESS® TAPS

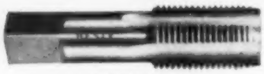
- Eliminate tap breakage due to chips
- Stronger because there are no flutes
- Produces stronger threads by compacting metal
- No cutting edges to wear down
- Provide fewer tool changes for more pieces per shift
- No chip interference permits tapping to bottom of blind holes
- Reduce plating failures, no chips in bath
- Drill breakage reduced especially in smaller sizes, because larger tap-drills used
- Recommended speeds higher than for conventional tapping
- Speed cycling time for automatic machine tapping
- Reduce cost per tapped hole wherever successfully applied

Booth 632
Philadelphia Convention Hall
Philadelphia, Pa.
May 1 to 8, 1958

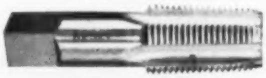
Our booth will feature the first public showing of the X-Press Tapping principle on a *working* demonstration.

Besly X-Press Taps will be set up on a turret drilling and tapping machine. You'll see exactly why X-Press Tapping produces stronger threads . . . Why chips are eliminated — the major cause of conventional tap damage and breakage. And, why X-Press Taps can reduce the cost per tapped hole wherever successfully applied. *Be sure to stop by and get all the facts.*

BESLY HAS A COMPLETE TAP LINE FOR EVERY JOB



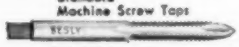
Straight Pipe Taps



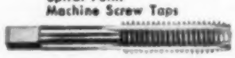
Taper Pipe Taps

Standard Hand Taps

Standard Machine Screw Taps



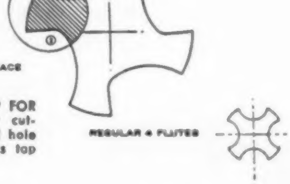
Spiral Point Machine Screw Taps



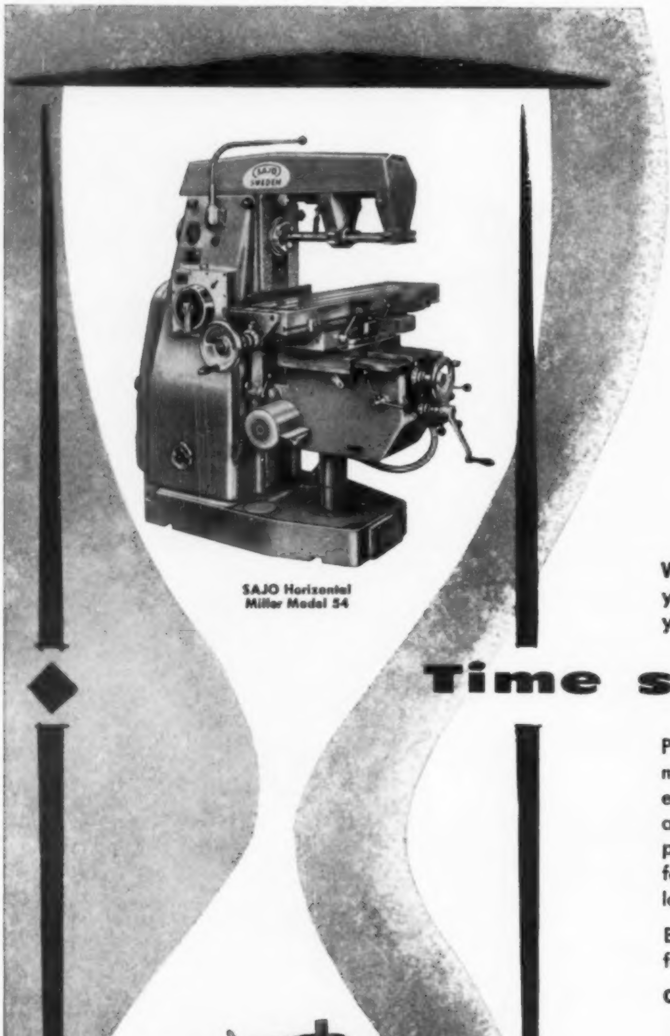
Spiral Point Hand Taps

Fluteless Spiral Pointed Taps

NEW "STRATE-FACE" TAP FOR CAST IRON ONLY—Freer cutting, more accurate tapped hole sizes, longer tap life, less tap breakage.



STANDARDS — immediate delivery. MODIFIED STANDARDS and "SPECIALS" — fast



SAJO Horizontal Miller Model 54

SAJO Vertical Miller Model 54

**We can't turn back the calendar, but—
you can buy SAJO Millers today at the same price
you paid for a comparable machine tool in 1949.**

Time stood still...

Produced by Sweden's master craftsmen, these modern machine tools are engineered to maintain precise tolerances in continuous heavy-duty production. An example is the unique SAJO spindle construction employing SKF precision 2-row staggered roller bearings followed by thrust ball bearings, providing better load distribution and silent, vibration-free operation.

Built to U. S. standards, SAJO Millers are recognized for their accuracy, dependability and long life.

Condensed specifications:
- table 52" x 11"
- longitudinal movement 33½"
- 16 spindle speeds, 39-1500 r.p.m.
- American Standard Taper No. 50
- main drive motor 7½ h.p.
- feed motor 1½ h.p.

Accessories:
Universal Dividing Head, Rotary Index Table, Vertical and Universal Milling Attachments, Slotting Attachment, Vises, Arbors.

Also available:
SAJO Plain and Universal Millers, table size 41½"x 9¼".

Here are "hindsight" opportunities for foresighted machine tool buyers.

Write for literature and references in your area.

austin
industrial corporation

76-V Mamaroneck Avenue, White Plains, N. Y.

HORIZONTAL AND VERTICAL SHAPERS—POWER HACKSAWS
Fast Service and Parts Available from Major Cities

2A158

new microbore turning heads feature speed, ruggedness, precision!

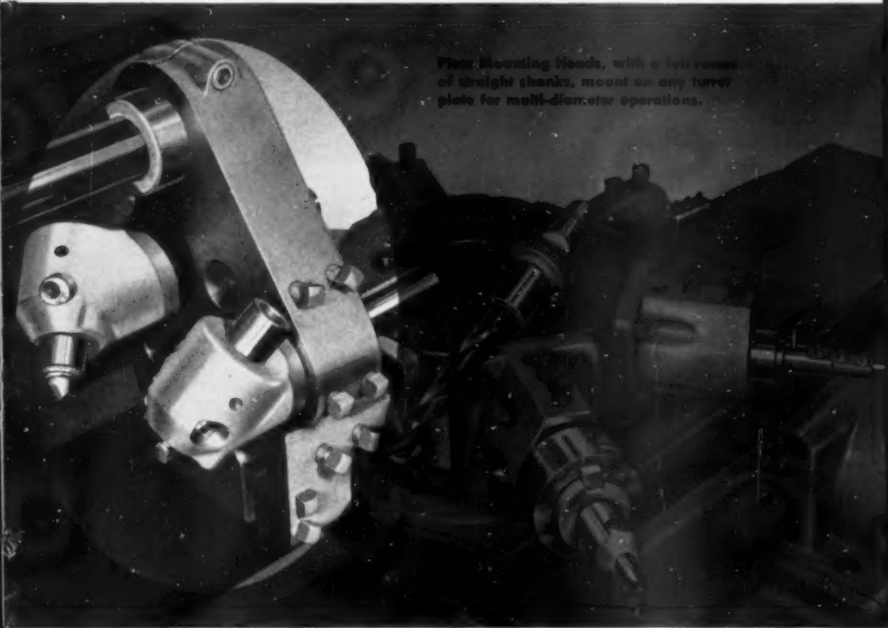
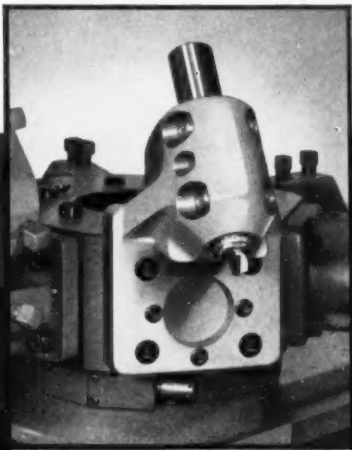


Plate Mounting Heads, with a full range of straight shanks, mount on any turret plate for multi-diameter operations.

Flange Mounting Heads mount directly on the face of the turret providing extreme rigidity.



Shank Mounting Heads permit quick, easy mounting in the turret and maximum versatility.

STANDARD, GENERAL PURPOSE FOR ALL HORIZONTAL TURRET LATHES!

Rugged, rigid and adjustable in seconds, these new general purpose turning heads perform a variety of single and multi-diameter operations repetitively with unfailing accuracy. Microbore's exclusive micrometer vernier adjustment provides a fast, accurate means of setting the tool point over a wide working range. *0" to 4" for Shank or Flange Mounting Heads. 0" to machine capacity for Plate Mounting Heads.* Extreme rigidity throughout permits heavy stock removal while holding to closest tolerances. This combination of speed, ruggedness and precision reduces downtime, increases accuracy of the end product. Write for complete information.

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See these new developments:

- **Pre-Set Tooling**
- **Tool Designers Layout Kit**
- **Flash-Change Bridgeport Spindle**
- **Turret Lathe Tooling**

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Gentlemen:

If you were to ask the question, *"Why do we import VDF Lathes?"* the answer would not be lower price. We selected these machines for two more important reasons — superiority of workmanship and excellence of performance. We believe that, size for size, these lathes have a larger spindle bore than any other make. They can cut a greater variety of threads and larger leads on any VDF standard lathe without special gears. The "S" series have a gear drive and a belt drive direct to main spindle — guaranteeing the finest finish with Tungsten Carbide and Ceramic tools. The lathes can also be supplied with an extended slide so that 2 tool posts can be used for faster removal of material. What's more, VDF lathes need less horse power for their own drive than any other lathes known.

The UNICOP Electronic Hydraulic Tracer Lathe will work with a precision of .0002", with so perfect a finish that grinding is practically eliminated. VDF Lathes cover a range from 15" to over 80" swing so that there is a VDF Lathe available to cover almost any machine shop and production need.

We'll be glad to discuss the advantages of VDF Lathes and how they will profit you; See us at our Booth # 1534 at the ASTE Show in Philadelphia.

THE FOLLOWING TOOLS WILL BE ON EXHIBITION:

- VDF Electronic Hydraulic Tracer Lathe Model V-3 Unicop Mark I
- VDF Lathe 44L
- VDF Lathe V-3
- VDF Lathe 2IRO
- 24" Standard Swedish Shaper

DRILL PRESSES

- Cordia S-32
- Cordia S-26
- Cordia S-18
- *Peddington Iron Workers

We'll be glad to demonstrate all of these machine tools — under power — at our permanent display in our new show room in New Brunswick. You are always most cordially invited.

Very truly,

John Seewald
President

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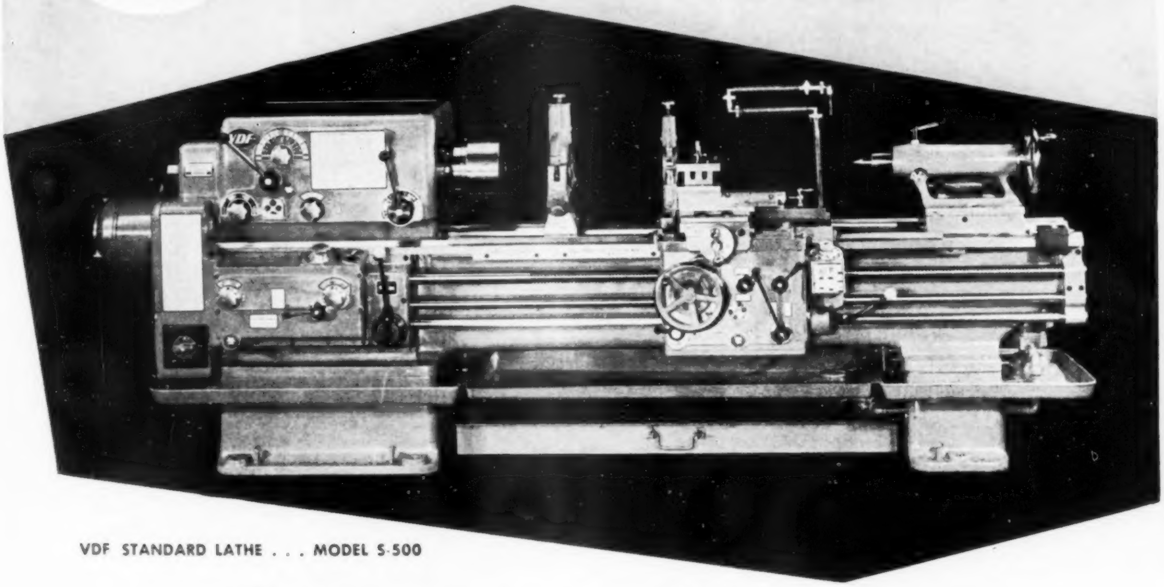
imported tools of the WORLD'S HIGHEST QUALITY

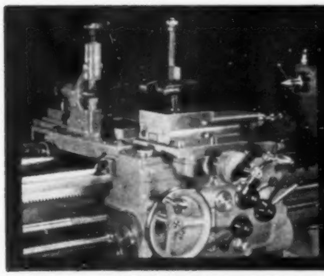
VDF **STANDARD, TRACING AND TURRET LATHES**



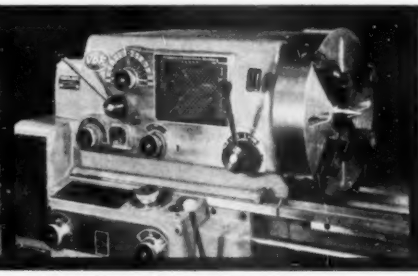
VDF STANDARD LATHE . . . MODEL S-500

All **VDF** machine tools are world famous for precision and high production rates, manual controlled or automated; they effect amazing economies. The rugged design of the VDF standard, copying and turret lathes boast many dramatic features, including: Power, Rigidity, Versatility and an extremely high degree of accuracy (.0002"). **VFD** Standard Lathe — 29" to 394" between centers. (Larger on special order.)

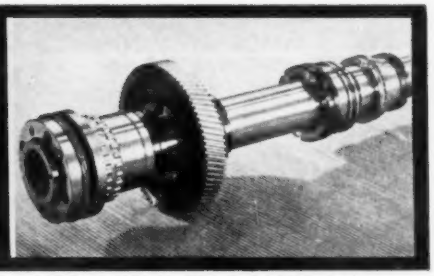
***Write for free booklets describing in detail:* VDF Lathes, Deep Hole Boring Machines, Tube Turning Lathes, Bevel Gear Generators and Planers.**



Carriage for Standard Engine Lathe



Head Stock S-500 Illustrating Pre-selector



Main Spindle for Standard Engine Lathes

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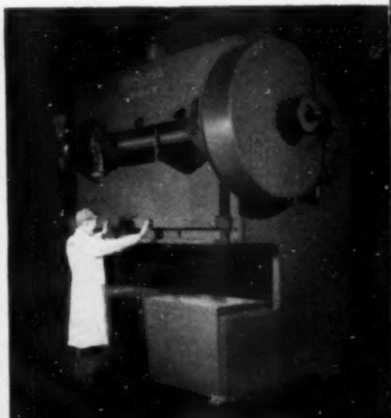
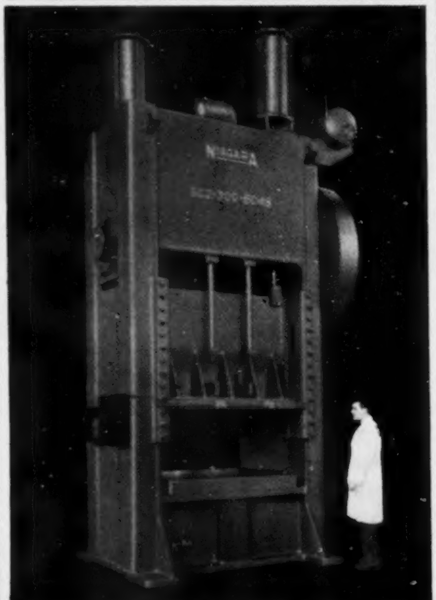
PRESS BRAKES
30-775 ton capacities.

COMBINATION CIRCLE SHEARS AND FLANGERS
High speed machines handling a wide range of medium to heavy work.

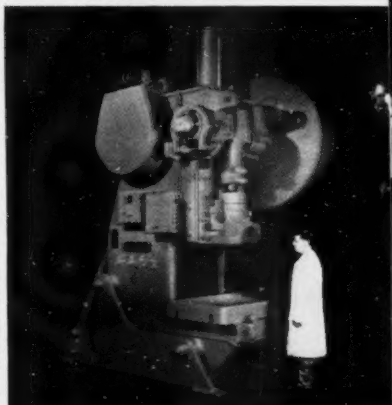


GAP FRAME DOUBLE CRANK PRESSES
3 - 6½ inch shaft diameters.
48 - 222 ton capacities. Also, inclinable series.

BENDING ROLLS
Hand and power driven for a wide range of lengths and thicknesses.



STRAIGHT SIDE SINGLE & DOUBLE CRANK PRESSES
50-400 ton capacities.

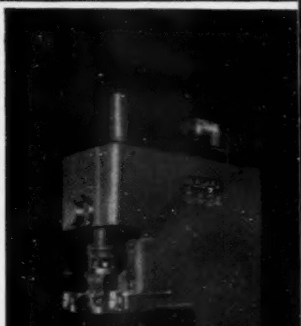


SINGLE CRANK OPEN BACK INCLINABLE PRESSES
1¼ - 7½ inch shaft diameters.
7 - 250 ton capacities.

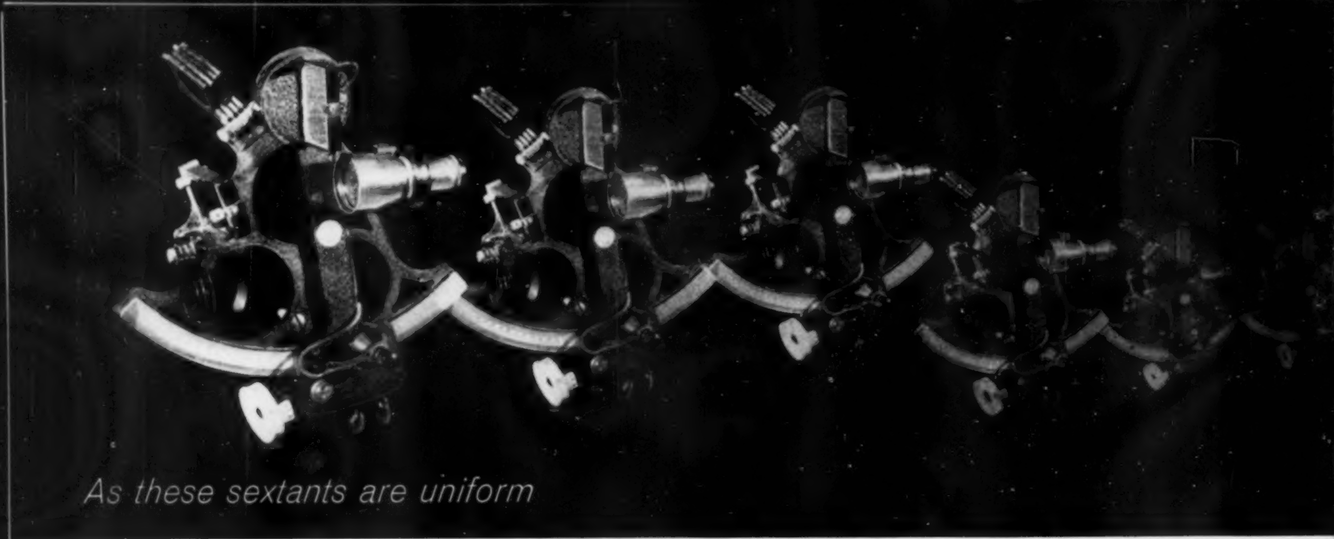
STRAIGHT SIDE ECCENTRIC GEARED PRESSES
One, two, and four-point suspension.
100-1000 ton capacities.
Standard and equipped for automation.

FRONT-TO-BACK CRANKSHAFT
OPEN BACK INCLINABLE PRESSES
Standard and automation models.
75-200 ton capacities.

FRONT-TO-BACK CRANKSHAFT
ADJUSTABLE BED PRESSES
Standard and modified models.
22-150 ton capacities.



FRONT-TO-BACK CRANKSHAFT
DEEP THROAT PRESSES
22-150 ton capacities



As these sextants are uniform

. . . So Card pipe taps are uniform, too

Your production's consistent ...because Card taps are uniform

Your first step in consistent production performance is the cutting tool itself. Because Card pipe taps are identical they keep production up to par — and predictable. Shopmen know about the uniformity of Card taps. Card gages are like that, too. S. W. CARD DIVISION, Mansfield, Mass. Card Warehouses: Atlanta, Chicago, Detroit, Fort Worth, Los Angeles, New York City and San Francisco.

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DIVISION OF UNION TWIST DRILL COMPANY

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If you use inserted blade cutters as much as printing presses use newsprint...

This brand cuts down your cutter usage, production time and costs!

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Union cutters — best in design, materials and workmanship — provide consistent top performance and lowest costs per piece you produce. Union builds special profit-boosting advantages into them. Besides this type of cutter, Union also makes solid milling and gear cutters, drills, end mills, reamers, hobs and carbide tools. **Available nationally through Union Distributors** and stocked in Union warehouses in Atlanta, Chicago, Detroit, Fort Worth, Los Angeles, New York City and San Francisco.

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See Your UNION DISTRIBUTOR for cutting tools that will save you time and money

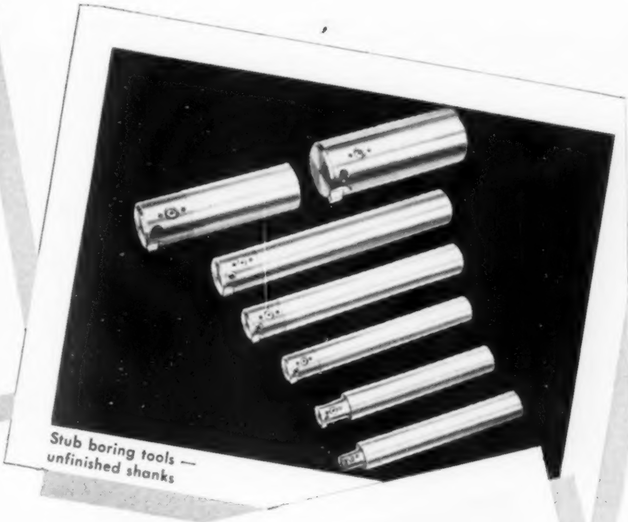
We have a NEW ADDITION

to this

We'd like you to be one of the first to be introduced to the *newest* Davis tooling developments.

They'll be shown for the first time at BOOTH No. 1517 at the A.S.T.E. show, Philadelphia. Be sure to see them.

Stub boring tool sets



Stub boring tools — unfinished shanks

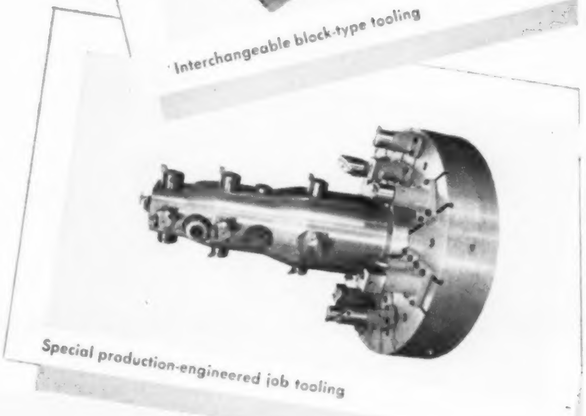
DAVIS family of fine tooling

Here's the industry's most comprehensive production-engineered tooling service. Davis standard and special job tooling counsel is as near as your local Davis field engineer. He's ready to assist you with the most modern tooling and fixture recommendations. By bringing him into the early design stages of your projects, he can simplify multiple machining sequences... cut costs... boost machine output.

Get *complete* tooling recommendations . . . call your Davis field engineer today!

Interchangeable block-type tooling

Line boring bars



Special production-engineered job tooling

DAVIS BORING TOOL DIVISION

GIDDINGS & LEWIS MACHINE TOOL CO.

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Complete line of Stub Boring Bars, Boring Heads, Block Type Cutters, Planing and Turning Tools, and Special Production-Engineered Job Tooling

G-91

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TWO *New* STARS on the *Super* STAGE

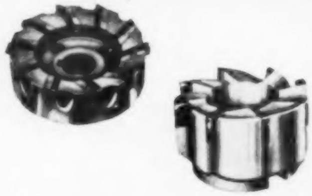
Brilliant Performers Join the Original Carbide Tool Line

New solid carbide single flute countersink #CS and center lap #CL.

Solid carbide flute section increases rigidity, eliminates chatter. Sharpening is by face grinding only. #CS has 82° taper, #CL has 60°. Available in 3/8", 1/2", 3/4" diameters, all 1/4" shanks. #CS available to order with 60° taper.

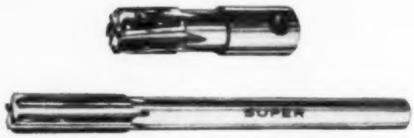
Instead of usual carbide tipped flutes, solid flute section provides much greater strength, less chatter, longer cutting life, less danger of breakage. Costs less than full length solid carbide construction. #RCS, fractional sizes 1/4" to 3/4". #RCB, decimal sizes .230" to .760", ground to specifications.

New straight shank carbide chucking reamer, #RCB and #RCS, with solid carbide flute section.



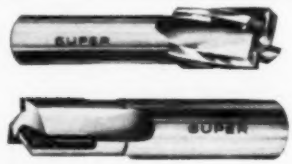
Milling cutters now in stock with premium carbide grades.

Standard and special carbide single point bits —turning, facing, threading, boring.



Reamers, all types. Stub screw machine and carbide tipped shown.

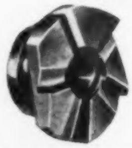
Carbide tipped and solid carbide twist drills, straight and tapered shanks, every type and purpose.



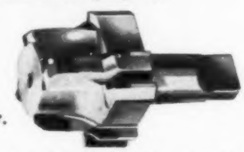
End mills, straight and spiral flute, solid and carbide tipped; for aluminum, iron, steel and other materials.

SEND FOR NEW COMPLETE CARBIDE TOOL CATALOG

Special carbide tools for every high production purpose. Pilot reamer shown.



Special face mill.



Form milling cutter.

For maintenance departments and construction field we also supply Core Vent and Speed Spiral masonry drills and tile and glass drills.

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PRODUCTION POINTERS from GISHOLT

FISHER GOVERNOR COMPANY TRIMS F.T.F. TIME

Cuts costs through Fastermatic features and accessories

You'll find some good tips in this job story—tips that tell how Fisher Governor, Marshalltown, Iowa, cuts costs by taking full advantage of the features and accessories of the Gisholt MASTERLINE Fastermatic Automatic Turret Lathes.

The job is on cast-steel stuffing box heads. Two Gisholt 2F Fastermatics handle first, second and third machining operations.

Here's the machining sequence: (Sections in italics show where a specific machine feature or accessory is used to cut costs.)

Operation 10: Chuck on large O.D. X, locating at Z in 18", 3-jaw air-chuck. *Hex turret is set at non-index* and rough-turns F-E. *Both front and rear cross slides operate during this one pass* to chamfer A and face B. F.t.f. time: 2.1 minutes.

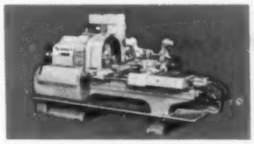
Operation 20: Chuck at X, locate at B in 18", 3-jaw air-chuck. Hex 1: rough-bore P *while front cross-slide tools* rough-face Z, chamfer T, and *rear cross-slide tools* finish-face V-S. Hex 2: drill M, chamfer N and cut groove U. Hex 3: semi-finish bore M, size W, chamfer Y-O. Hex 4: semi-finish-bore P, chamfer R. Hex 5: finish-bore M and size P, holding to .001". Hex 6: finish-ream P. Floor-to-floor time: 10.3 minutes.

Operation 30: Special fixture centralizes part on W, clamping back against Z with clamp at B. Hex 1: rough-turn F-E, chamfer corner at C, start-drill and rough-form J. Hex 2: drill K to depth, chamfering L at base of hole; semi-finish J and finish-turn F-E. Hex 3: semi-finish-bore K, chamfer J, using 10° finish-chamfering tool while *front cross-slide tools* finish-face H-D and chamfer G. Hex 4: finish-bore K. Hex 5: thread F, *using full-length lead screw threading attachment* and self-opening die-head. Hex 6: finish-ream K. F.t.f. time: 8.1 minutes.

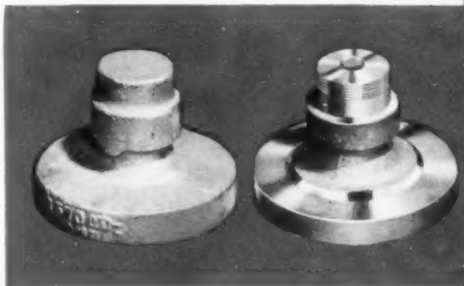
To eliminate tool tracks on all three operations, *both front and rear cross slides have .015" tool relief in either direction*, used as required.

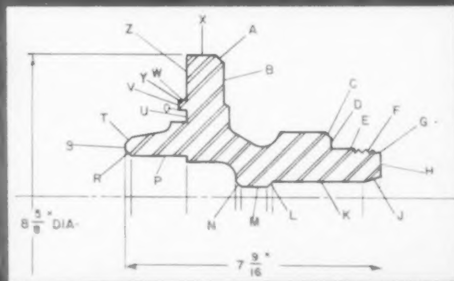
One operator handles both machines, uses simple Fastermatic Job Record Sheet to speed similar setups on variety of sizes. Full-length lead screw threading attachment provides accurate lead for threading.

Ask for new Fastermatic Catalog 1179-B.

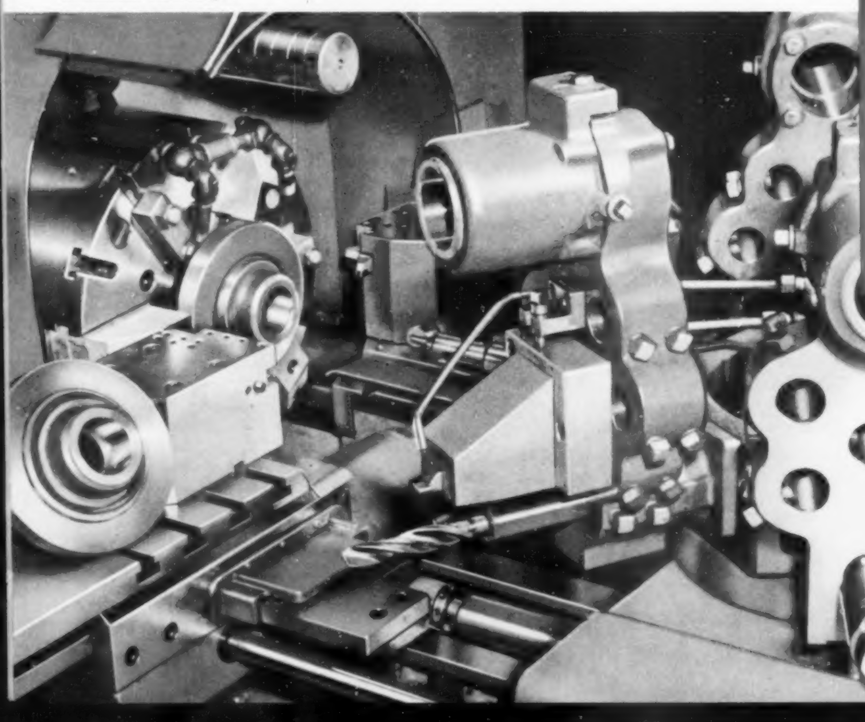


Rough workpiece and finished part showing surfaces machined in the three operations.





Second machining operation tooling and workpiece. Smooth hydraulic feeds assure accuracy and fine finish on all surfaces. Automatic cycle permits operator to handle second unit for maximum efficiency.



AIR BRAKE DIV. OF WESTINGHOUSE AIR BRAKE CUTS F.T.F. TIME 25%

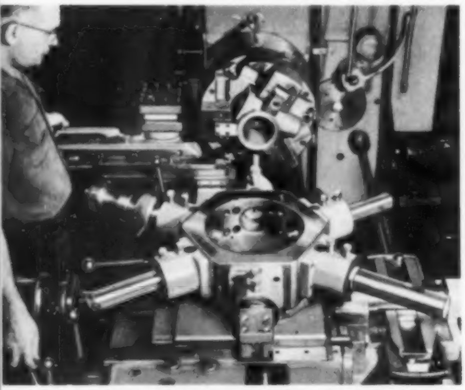
Chucking fixture, special loader and cross-feeding turret simplify operation

Here's a fixture job story to save for future reference. Previously, the workpiece—a cast iron, automatic slack-adjuster casing for railroad use—caused problems in both chucking and machining. Today, Westinghouse Air Brake Company's Air Brake Div., Wilmerding, Pa., plant is handling it in two fast operations. Here's how:

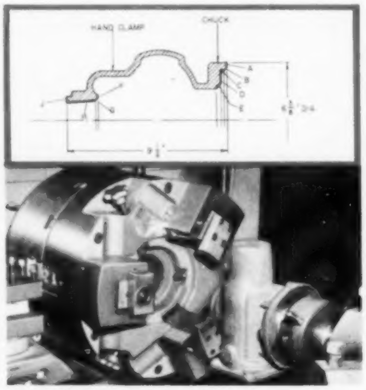
First, need for expensive special tooling is eliminated by using a Gisholt MASTERLINE 2L Saddle Type Turret Lathe, equipped with a cross-feeding hexagon turret with a taper attachment. Chucking the rough workpieces is fast and easy. A turret-mounted expanding loader-centralizer supports the part during loading in a 3-jaw, bonnet-type chucking fixture, operated by and mounted on the face of an 18", 3-jaw air chuck. The piece is located longitudinally from the turret and chucked on the large 6⅜"-diameter flange, with three hand-clamp screws supporting the work at the rear.

Let's look at the first machining operation. Surfaces are indicated on the drawing shown. Hex station 2 straight-bores H; station 3 rough-faces A-D, using hex turret cross feed with two tools in holder. Hex 4 straddle-faces F-J, using hex turret cross feed and two tools in bar, and reverse-feeds to finish surfaces and remove tool tracks. (Reverse feed is a standard feature on all Gisholt turret lathes.) Spindle rotation is reversed and tools on hex stations 5 and 6 rough- and finish-taper-bore H and chamfer G. Front square turret tools finish-bore C, finish-face A, chamfer B-E. Floor-to-floor time is a fast 8.4 minutes.

The same basic tooling arrangement handles the second operation on the other end of the part in just 5.5 minutes floor-to-floor time.

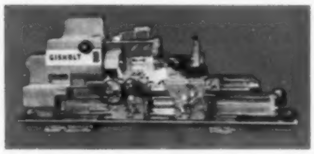


First operation turret-tooling. Cross-feeding turret eliminates special tooling costs, handles taper-boring and cross-facing operations quickly and economically.



Turret-loader and chucking fixture. Three extended jaws chuck on 6⅜"-diameter flange, with one jaw pivoting for loading, unloading clearance. Part supported by hand-operated clamp screws at back of fixture.

Special loader, designed by Westinghouse Air Brake tool engineers, speeds chucking operation. Standard tools on cross-feeding hex turret with taper attachment cut costs, handle straight or taper boring and facing operations to required accuracy.



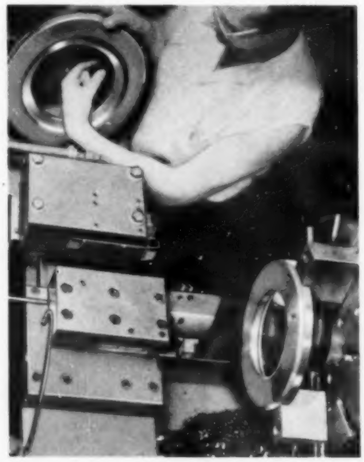
EXTRA OPERATIONS ELIMINATED WITH THIS SETUP

Combines table feed and slide movements to machine maximum number of surfaces in one chucking

Here's another good job to add to your files. It shows you how to obtain complex feeding motions with minimum tooling investment, using the versatile Simplimatic. This setup handles two different sizes of steel rear-axle drive gears. 50 h.p. motor assures ample power for all cuts.

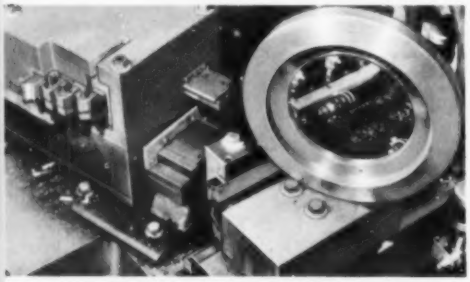
Check the first operation. A 21", 3-jaw air-chuck grips the part on the large O.D., locating against the rough beveled face. The platen table traverses forward, then changes to feed as tools on the rear independent slide rough- and finish-bore. As this operation is completed, more tools on the rear slide, plus the front slide tools, are in position for machining. Moving back from the machine center line, standard rear slide feed movement back-faces and back-bores the web, and chamfers at the front and back of the bore. Rear slide tools then reverse-feed to eliminate tool tracks, clean up the cuts, and clear for withdrawal, while tools on the front independent slide face and chamfer the large O.D. The platen table then reverse-traverses and slides return-traverse to starting position. Complete f.t.f. time is only 2.35 minutes for the first operation.

The same operator handles another Simplimatic to perform the second operation on the other side of the part. Work is held in the bore with a 21", 3-jaw air-chuck. This time the platen table merely positions the tools. Front slide movement turns the O.D. and forms a radius on the edge of the co-bore, while three cam-controlled tools on the rear independent slide rough- and finish-machine the beveled face and form a radius on the O.D. edge. F.t.f. time—2.5 minutes.



First operation tooling. Tools (facing operator) on rear slide rough- and finish-bore, using table feed. Tools on opposite side back-face, form co-bore and chamfer back edge, using standard slide movement.

Ask for new Simplimatic Catalog 1159-C.



Second operation. Note three leading tools on rear slide, controlled by cam at rear of block to generate beveled face on part. Slide set at correct angle minimizes tool travel required from cam.

Simplimatic handles extra surfaces through table feed combined with standard slide movement, eliminating extra handling and secondary operations. Flat platen table permits slide location at exact angle required, minimizing special tooling costs.

ASK YOUR GISHOLT REPRESENTATIVE ABOUT FACTORY-REBUILT

HOW TO SPEED BALANCING AND CUT HANDLING COSTS

Integral correction unit lets operator complete balancing and correcting from one station

This setup shows how a well-known automobile manufacturer cut balancing time and costs on a variety of automatic transmission parts. It shows how the addition of a correction drilling unit to a standard Gisholt 1SV1 Balancer permits measurement, location, correction and inspection for balance to be handled from one station.

Workpiece shown on adapter. Note numbered reference dial for fast, accurate angle location and hydraulic-operated thrust support at base of part.

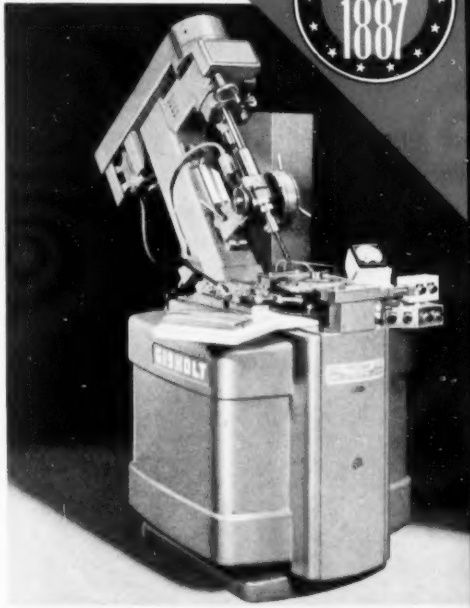
Here's how a first turbine disc and hub assembly part is balanced. Because the parts are narrow and of large diameter, only a single-plane balancing operation is required so the lower cost 1SV1 Balancer is ideal. Although location is in the splined bore, close balancing accuracy is easily maintained, using an air-operated expanding splined arbor.

A numbered disc rotates with the work. The unbalance angle is indicated on this disc by a strobe lamp in the same visual plane as the amount meter. The amount meter is calibrated in terms of drill depth. A graduated reference dial on the turnstile that feeds the drill permits the operator to drill to the indicated depth quickly, with minimum chance of error. He merely matches meter reading to the depth dial reading to correct for unbalance.

The drill head is mounted 30 degrees from the vertical for loading-unloading clearance. A hydraulic-operated thrust support at the base of the part compensates for vertical and horizontal thrust during the correction drilling.

A production rate of 60 pieces per hour is realized by adding a correction drilling unit to the standard 1SV1 Balancer. Saves time, requires minimum floor space, prevents error by letting one operator perform all necessary operations.

MASTERLINE GISHOLT SINCE 1887



Note simple, compact arrangement that permits measuring, locating, correcting and inspecting for balance at one station.

POWERS REGULATOR SAVES 40% ON THESE PARTS

Hydraulic drive automates production, improves quality

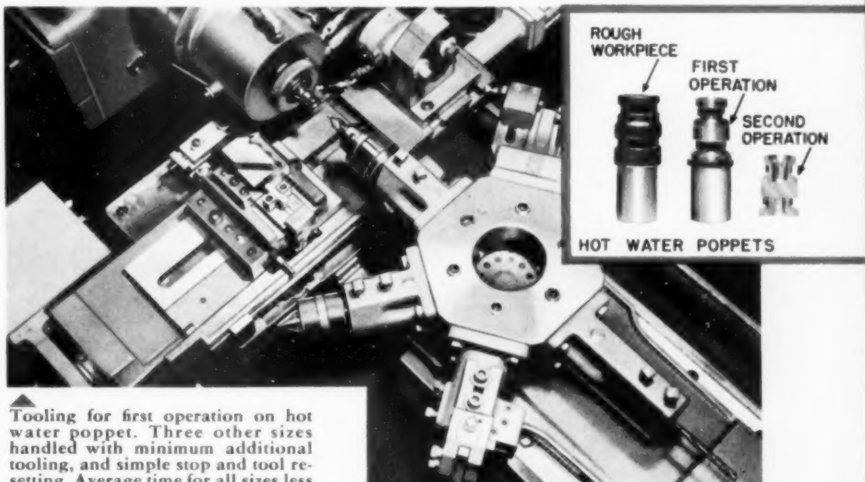
Take a look at these cast bronze hot and cold water poppets, handled with this setup at the Powers Regulator Co., Skokie, Ill., plant. A number of surfaces are automatically machined to close tolerances, using a Gisholt MASTERLINE No. 3 Ram Type Turret Lathe with independent hydraulic drive units for the turret and cross slide.

Here's how a typical 2⅜″-long, ¾″-diameter hot water poppet is handled in two fast operations. Each casting has a chucking lug turned to size, with the end faced for location against a stop within an outside, air-operated collet chuck. Hexagon turret tools center-drill the end. Then a live center supports as the O.D. contour is formed from the rear of the cross slide. Next, the O.D. edge is chamfered and the piece is rough- and finish-drilled. Two tools in a special holder on the last hex turret station size two diameters on the O.D. A special, cam-operated front cross-slide tool generates two angular seating surfaces on the O.D. within .0003″ to complete the operation in only 47 seconds f.t.f.

For the second operation on the opposite end, the part is held on the machined O.D. in the same collet chuck, and located against the same stop. Front cross-slide tooling isn't used, but remains in place. The chucking lug is faced off from the rear of the cross slide. Except for different size drills and minor cutter adjustments, the same tooling setup is used to center-drill, rough- and finish-drill, and chamfer the O.D. and I.D. edges to complete the part in only 38 seconds f.t.f. time.

Automatic cycle cuts time, assures correct speeds and feeds on all surfaces, for increased accuracy, uniform quality, longer tool life. Operator simply loads... unloads ...and initiates cycle.

Ask for new Catalog 1182-A on Ram Type Turret Lathes with hydraulic drive.



Tooling for first operation on hot water poppet. Three other sizes handled with minimum additional tooling, and simple stop and tool resetting. Average time for all sizes less than 1 minute. Inset: hot water poppet described.

GISHOLT

MACHINES WITH NEW MACHINE GUARANTEE

HOW FAIRBANKS-MORSE CUT TIME 27% ON LINERS

Tandem tool slides handle 16 surfaces in one chucking

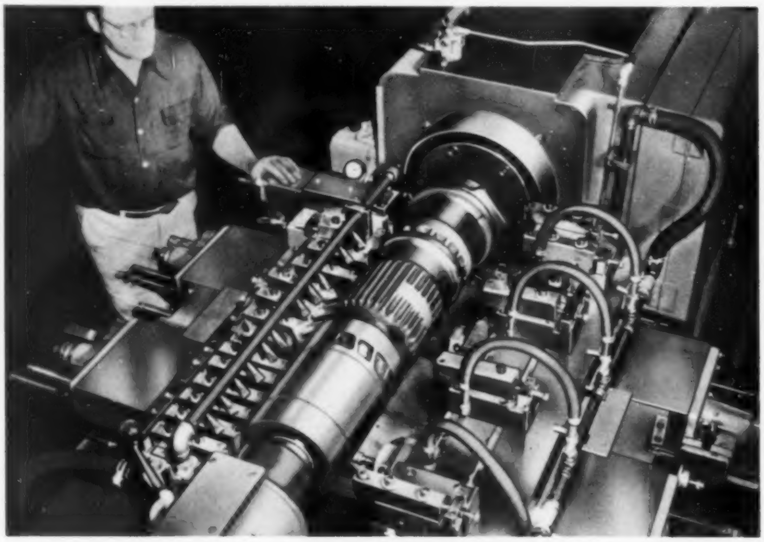
Machining multiple surfaces on long workpieces? Interested in maintaining concentricity and parallelism by completing all work in one handling? Then this setup on the Gisholt MASTERLINE No. 24 Automatic Production Lathe will interest you.

Here is how the Fairbanks, Morse & Co. plant at Beloit, Wis., is handling O.D. machining operations on one type of diesel cylinder liner. The 42½"-long, 9"-diameter parts are loaded on an air-operated, pin-type expanding mandrel. A retractable stop permits longitudinal location in one of the liner ports. A heavy-duty tailstock, mounted on an independent slide, is traversed in to the center line to provide support at the end of the mandrel.

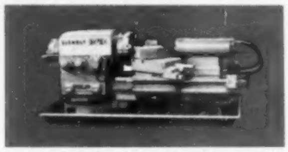
Two independent tool slides, linked together to operate as a unit, are mounted on extra wide front and rear carriages. After the part is chucked, the front slides feed to depth and then the carriage feeds longitudinally as 13 tools rough-turn ten different diameters. Three tools split up each of the two longest cuts to reduce machining time. Two diameters, closest to the spindle, are handled by one tool on a cam-operated sliding tool holder. At the same time, six tools on the rear carriage slides feed in to face both ends, face two shoulders and form two radii.

After machining, the operator retracts the tailstock quill and its supporting slide moves the tailstock away from center, clearing the mandrel for unloading. F.t.f. time: 6 min.

Tools and stops are quickly reset for a similar finishing operation on these parts.



Multiple surfaces on large parts are more easily handled on rugged No. 24. Basic design offers more tooling flexibility and automatic cycle frees operator for other work.



Rear overhead view showing 42½"-long, 9"-diameter cylinder liner on tailstock-supported mandrel. 50 h.p. main drive motor provides ample power for machining loads imposed by 19 separate tools.

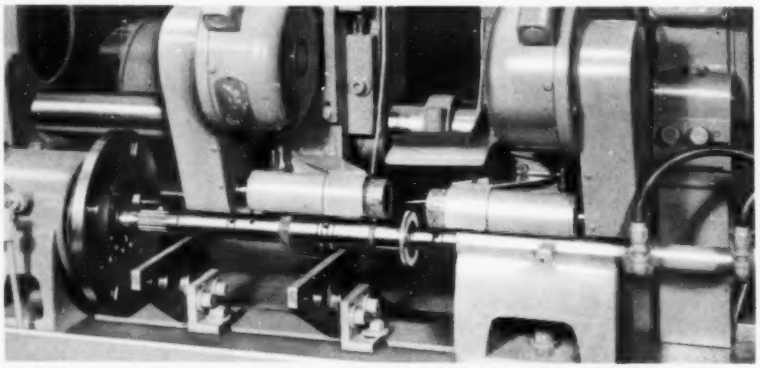
2-IN-1 OPERATION FINISHES FLAT SURFACES FASTER

Two opposing faces Superfinished at the same time

Relatively low-cost special tooling is used on this Model 51A General-Purpose Superfinisher, to permit Superfinishing opposing faces on steel transmission output shafts at high production rates. The workpieces are held between centers and driven from the splined end. Simple, adjustable loading rails speed work handling.

Here's the operation in a nutshell: After loading, the operator presses the cycle start button and two rotating Superfinish quills, carrying cup-type wheels, engage the opposing thrust and seal faces. Each wheel removes .0003" to .0004" stock to clean up all surface defects resulting from grinding and heat-treat. In addition, the 30-40 micro-inch ground surfaces are reduced to 8 micro-inches RMS. Total f. t. f. time: 24 seconds.

Both the 51A and the larger capacity 52A General-Purpose Superfinishers are easily adapted to jobs like this. There is ample space for rigidly mounting special units on the overhead support and traverse bars. Setup is fast for either small lots or long production runs. Because the Superfinishing cycle is automatic, the operator has time to handle another unit or perform other work.



Steel transmission output shaft on specially tooled Model 51A. Opposing faces simultaneously Superfinished by cup-type wheels to 8 micro-inch RMS finish in only 24 seconds f.t.f.

Superfinishing opposing faces in one fast operation saves time, improves accuracy. Also provides finer finish as grinding and heat-treat defects are removed, exposing true base metal for longer service life.

Ask for new Superfinisher Catalog 1169-B.

No. 3-458
701

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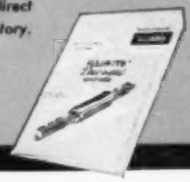

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See the Heycop Hydraulic Copying Lathe —40" between centers, it permits copy-turning of the most intricate patterns. Patented Heyco hydraulic tracer system with its 60 degree tracer can be used for all universal turning operations, screw cutting and all contouring, in-cluding radii and square shoulders. See it machining automotive parts.
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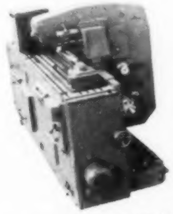
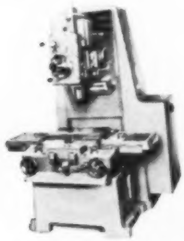


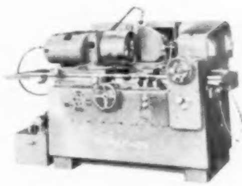
See the Hurth Spline and Clutch Milling Machine demonstrating high speed spline cutting on automotive axle shafts. Faster and more accurate than conventional milling or hobbing. See how the **Hurth Gear De-burring and Chamfering Automat** can de-burr or chamfer all types of gears in 0.3 to 0.75 seconds per tooth!

See the Schaudt Precision Cylindrical Grinder machining servo-motor shafts. See its 8" swing, single lever control and positive infeed control, guaranteed accurate within .00005". Grinding spindle, accurate within .00004", is guaranteed for life. **Has optional** internal and face grinding attachments.

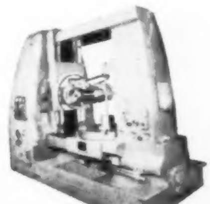
See the S & F Gear Tester, Model 126—the first sensitive gear tester for large gears, accurate enough to repeat within .00001", even with loads up to 4500 pound gears! See all the other S & F super-sensitive gear testers—the most accurate gear testers made—record run-out, tooth-to-tooth and total composite errors on Graphotest report.



See the newest Lindner Optical Jig Borer, Model LB-12—the littlest Lindner of them all—with 12" x 20" table, developed primarily for the precision electro-mechanical industry. See it machining intricate fixtures. See its big brother, Model LB15A, with patented Autopositioner machining gear boxes to close tolerances.



See the Reinecker Internal and Face Grinding Automat—it features ultra-precision grinding of straight and tapered **bores** and **faces** in one set-up. See it grinding the bore and face of a servomotor housing automatically, with automatic size control. Also see the **Reinecker Universal Tool Grinder**, with grinding head swiveling 360 degrees in three planes!



See the Liebherr Precision Gear Hobber. This massive 24-ton machine handles gears up to 50" in diameter. See how its 25 hp Ward-Leonard drive, with drive motor positioned above the hob slide, brings power directly to the hob drive. See it cutting large gears.

See the Trebel Production Balancer—it indicates dynamic and/or static unbalance by both single resultant and coordinate system methods. No graphs or slides required. The conversion is made directly by the machine's electronic indicator unit showing the required correction weights in each plane by means of a microammeter and simultaneous color-coding lights.

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Manual material loading is time consuming and impairs the steady flow of modern production sawing.

The new Automatic Loading Table, designed for Model WKA-200 Cold Saw, assures true automation. It provides automatic loading, infeeding, squaring, piece-for-piece cutting, discharge of finished pieces, and ejection of scrap ends.

The sequence of the cycle is as follows:
The bar is released from the loading table and rolls onto the material track. From there it is advanced by hydraulically driven positive infeed rollers toward the length gauge. An auxiliary stop holds the new bar for a short squaring cut.

After the squaring cut has been made, the auxiliary stop releases the bar to move against the regular gauge with its built-in limit stop, initiating the production cutting cycle.

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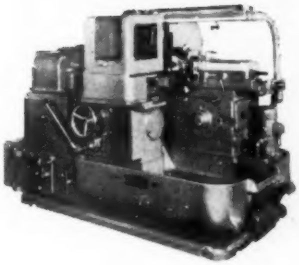

AUTOMATIC FEEDS of various types can be easily applied to TAREX Automatics as they are designed to mount feeds in almost *any* position . . . including the front and rear slides or in the oblique position; also at the rear of the turret as well as to feed parts through the headstock.

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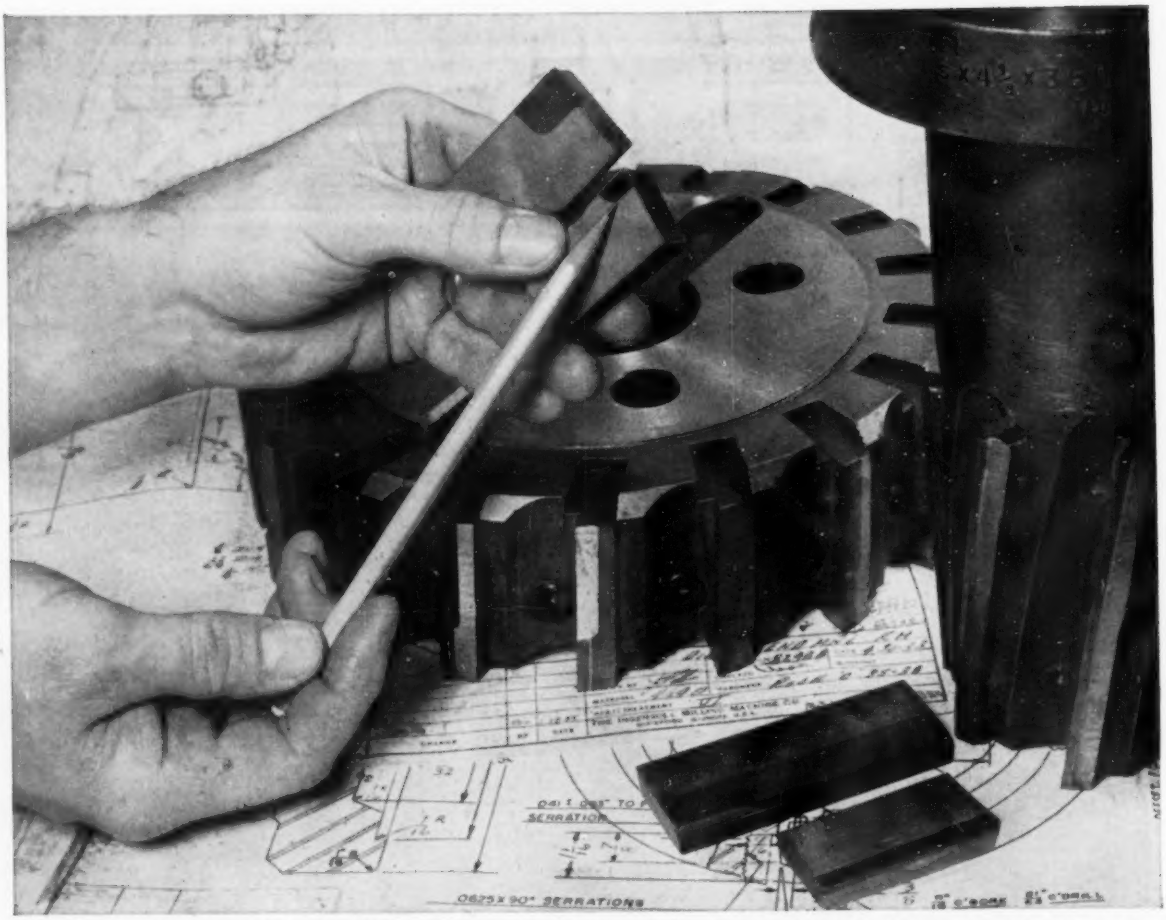

Ingersoll Type "NX" inserted blade Face Mills . . . for milling shoulders in steel or cast iron. Tips can be furnished any length to suit workpiece.

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The initial price of the blades and the number of pieces produced between grinds, the design of the cutter and economical arrangement of the tip are all important considerations. Ingersoll's cutter service also includes a study of the machine, metal, speed, feed, rate of production and finish requirements. Only after considering all these can we recommend a cutter which will do your particular job best at the lowest cost.

We are used to working with these variables and offer you helpful counseling service as well as a proven line of cutters. Our job is to help you reduce your milling and boring costs, not just once but continuously.

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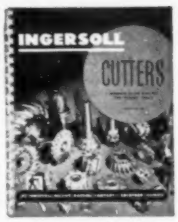

If you do not have a copy of this book, write us and we will send you one. It describes in detail the complete line of Ingersoll inserted blade milling and boring tools. Ask for Catalog #66F

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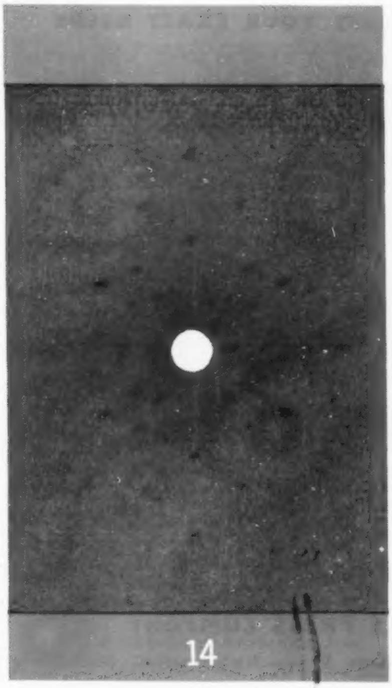

WHICH OF THESE DIAMOND TOOLS WILL OUTPERFORM THE OTHERS 3 to 1?

Here are X-ray diffraction patterns of Hoglund dressing tools. X-ray diagrams No. 9 and No. 5 are typical of the orientation of tools manufactured by conventional methods. No. 14 is an X-ray diagram of a tool precisely oriented by *X-ray diffraction.* It will *outperform conventional tools 3 to 1!*

Through the use of X-ray orientation a whole series of Hoglund tools can be properly oriented easily by diamond tool manufacturers.

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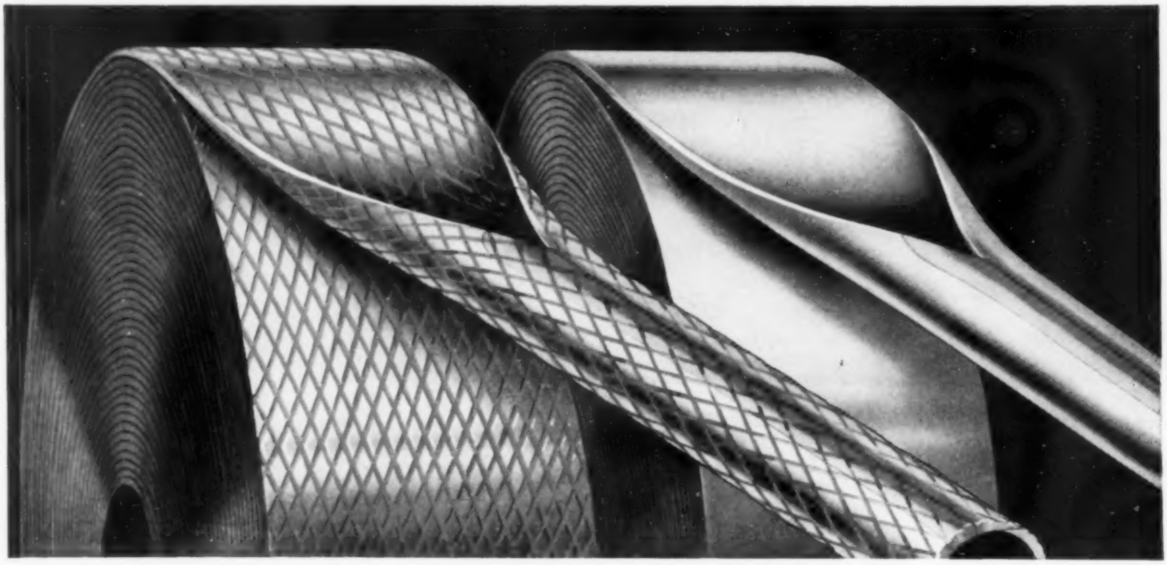

Quaker State Metals Company, leading fabricator of aluminum building products, recently installed a 25 kw, 450,000 cycle TOCCOtron vacuum tube oscillator for continuous welding of aluminum tubing. Both plain and patterned strip, anodized or untreated according to end-use requirements, is continuously welded. Diameters vary from ½" to 1" O. D. and wall thicknesses from .024 to .064".

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A Step Forward

Rapid improvements in manufacturing techniques have increased the need for adequate education and research facilities for the advancement of scientific knowledge in the field of tool engineering.

This represents a challenge to your Society. During a recent meeting your Board of Directors resolved that:

> " . . . the American Society of Tool Engineers shall take immediate steps to develop a program which will provide the necessary facilities and methods for the professional development of engineers in the science of tool engineering."

When preliminary plans are completed and presented to the board they will include:

- A new National Headquarters, designed to meet the expanding needs of all phases of society activities
- An ASTE Education and Training Center to provide complete practical and technical education of students who want a career in tool engineering
- An ASTE Research Center to add to the store of fundamental knowledge on which improvements in productivity are based.

In 1932, our founders enlisted the thought and knowledge of every member to advance the profession of tool engineering.

Today, as we plan another great forward step, we again call for the support of all ASTE members.

The objectives of the resolution, when carried out, will be tangible evidence of the larger objective of the Society —a higher standard of living for everyone.

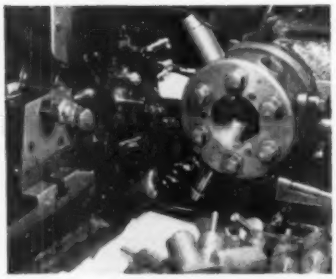
H E Collins

PRESIDENT

American Society of Tool Engineers

Short, fast-breaking chips indicate machinability of Rycut 20 —also save time by eliminating problems of chip clearance.

Rycut 20 alloy steel increases rotor output 40%, doubles tool life



Using Rycut 20 bars, Buckeye Tools Corp. machines motor rotors in less than two minutes floor-to-floor time.

Here's a manufacturer getting 34 rotors an hour compared with a previous 24—plus a 100% reduction in tool grinding.

How? By switching to Rycut 20 alloy steel. The company is Buckeye Tools Corporation, of Dayton, Ohio. A Ryerson alloy specialist recommended Rycut 20 (a low-carbon, lead-bearing alloy) for the rotor of their "Cadet" nibbler, an air-operated contour-cutter used on sheet metal, tubing and plastics.

World's fastest machining alloy steel in its carbon range, Rycut 20 is widely used for gears, cams, spindles, shafts and bearings. Like all other alloys from Ryerson, it carries a Certificate of Analysis and Hardenability which tells you exactly what steel you're getting and what to expect of it. A phone call to a Ryerson steel specialist at your nearby Ryerson plant may bring important cost reductions in your metalworking operations.

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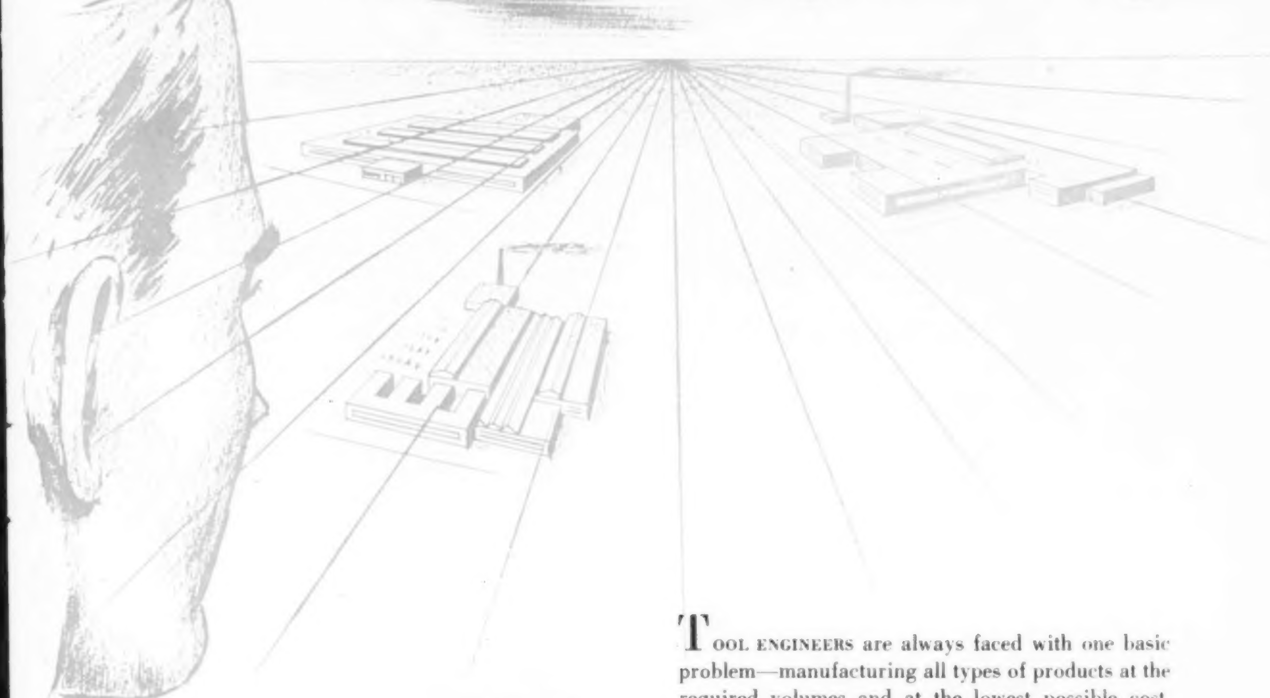
LOOKING AHEAD in tool engineering



By T. W. Black
Senior Associate Editor

New materials, new products, and the continuing demand for higher productivity and improved quality, present a tremendous challenge to tool engineers. Research, development and greater emphasis on education will help the tool engineering profession meet this challenge. The future belongs to those companies—and individuals—who plan for it today.

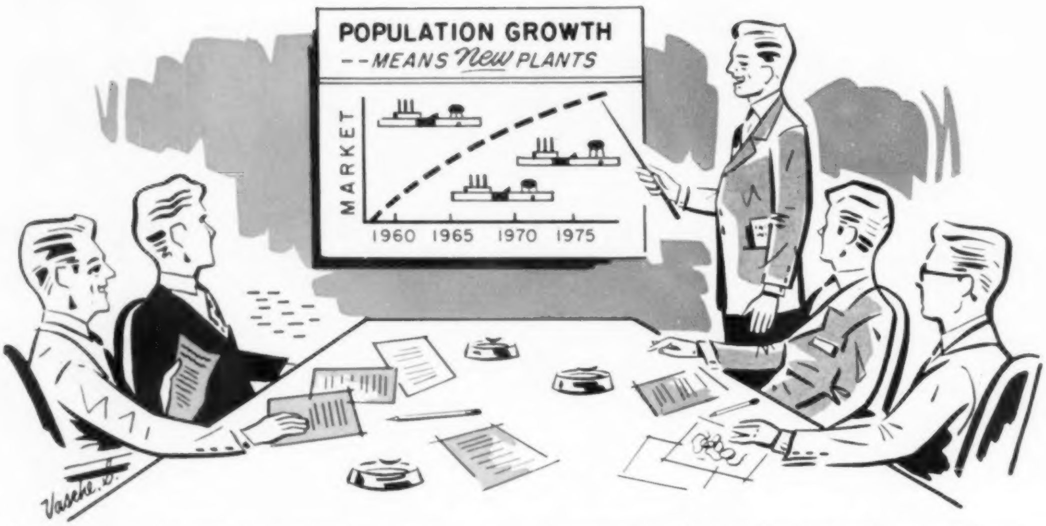
TOOL ENGINEERS are always faced with one basic problem—manufacturing all types of products at the required volumes and at the lowest possible cost. During the next few years, finding acceptable solutions to this problem will be complicated by the nature of many of the new products that will be introduced and by the need for finding and training sufficient personnel in an expanding economy.

Industrial Growth

Over the years employment and business activity in the United States has followed a consistent upward trend. Recessions and setbacks since World War II, although keenly felt in some industries for short periods of time, have not affected the over-all upward trend. There is every reason to believe that this trend will continue.

Population growth alone will be a powerful stimulus to industry. The United States Bureau of the Census has estimated that U.S. population will increase by 30 million persons during the next ten years. This increase will make itself felt in increased consumer demand for all types of products.

A second stimulus to industry will be the increas-



Population growth will be a powerful stimulus to industry during the next twenty years, calling for expanded production facilities and improved manufacturing techniques.

ing influence of military spending for aircraft, guided missiles and other modern weapons. Unless there is an unforeseen easing of international tensions, requirements for military hardware will continue to remain at high levels.

Manpower Problems: Industrial growth will bring new problems to tool engineers. In the long run, in an expanding economy, "overemployment," rather than underemployment or unemployment, will be a common problem. The 30 million new citizens who appear during the next ten years will, obviously, be too young to work. Retirements from the national labor force will be high; consequently, the demand for workers may exceed the supply, particularly in fields requiring a high degree of training or skill. Tool engineers will have to cope with this manpower shortage.

Technological Advances: The rate of technological advance, stimulated by the pressures of civilian competition and improvements in military equipment, has continuously accelerated during the past ten years and will no doubt continue to do so during the next decade. The transition from manned aircraft to guided missiles is a case in point. These missiles contain complex control equipment, much of it relatively new in design, and they are designed to travel at supersonic speeds. Requirements for skilled manual assembly are multiplied in products containing electronic equipment, and new manufacturing techniques are required to fabricate the exotic metals and ceramic materials used in missile and rocket manufacture.

Machining speeds for materials such as the stainless steels, molybdenum, titanium, and others are substantially lower than those for aluminum, magnesium and similar lightweight metals. Although some of these harder materials can be cut by conventional methods, cutting speeds are extremely low. The so-called "superhard" materials can be "machined" by ultrasonic, electrical and chemical methods, but again at excessively low rates. As pointed out by Alfred H. Peterson of Lockheed Aircraft in a recent talk, average machining speeds obtained with the harder materials today are in the same range as machining speeds obtained thirty to forty years ago with conventional materials.

According to Peterson, the aircraft industry is faced with the necessity of adding a greater number of machine tools to produce the same volume of parts, or developing faster methods of machining hard materials. Much work is being done on this problem.

Reliability requirements also present a manufacturing problem. In an Atlas missile, for instance, which contains approximately 300,000 parts, failure of any one part can mean the failure of the entire missile. Even if the missile had only 100 critical components, assuming that each component has a 99 percent reliability, total reliability of the assembly is only 36.8 percent. If each component has 98 percent reliability, the reliability of the entire assembly is reduced to 13.3 percent. These figures are taken from a recent talk by H. Thomas Hallowell, Jr., president of Standard Pressed Steel Co. Parts and assemblies must be manufactured to extremely high quality standards, calling, in some cases, for entirely new manufacturing techniques.

Lead Times and Flexibility: In a time of rapid technological advance, which means frequent

and extensive product design changes, lead times inescapably become shorter and the length of production runs is also shortened. This is true not only in the aircraft and missile fields, but in the fields of other modern weapons as well. It is also true in the manufacture of civilian products such as automobiles. The announcement of one manufacturer that his company will introduce a completely new model each year, rather than relying on yearly face-lift changes illustrates a trend that may become commonplace in many industries during the next few years.

With these factors in mind, it is apparent that tool engineers will have to concentrate on ways of cutting the time from blueprint to manufactured product. They will also have to plan for maximum equipment flexibility.

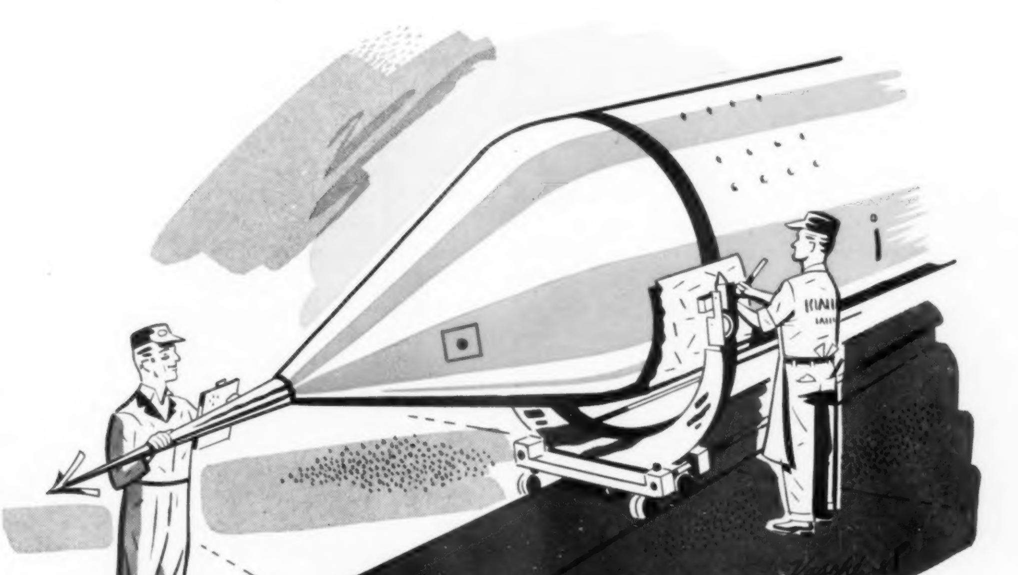
Automaticity

Automatic machines and automatic work-handling devices are an effective means of solving manpower and—in many cases—quality problems. When large quantities of identical production parts are processed over a long period of time, "Detroit automation" in which automatic work-handling devices are built into individual machines and entire production lines become feasible. Changeovers to new product designs, however, often entail major machine modifications and even rerouting of entire production lines. Lack of machine versatility is costly. One way of overcoming this limitation is to design transfer machines, rotary index machines and the like, according to "building block" principles, in which production lines can be modified by interchanging standard components. This type of automation has already reached a high stage of development.

It can be anticipated that further developments in automation will come through the automatic programming of machine tools and, indeed, entire production lines. The development of tape and punched-card controlled machines is being watched by many tool engineers.

The majority of plants have adopted a "wait and see" attitude toward machines controlled by punched cards or tapes. Initial costs of control equipment are high, and to these initial costs must be added the costs of hiring or training personnel who are capable of writing programs and adjusting and maintaining complex control equipment.

Installing Numerical Controls: Nevertheless, tape control provides a means for reducing machining and lead times and, since it represents an important future trend, it may be worthwhile to discuss several recent applications in detail. Some of the problems associated with installing a numerically controlled milling machine at the Martin Baltimore Div. were recently discussed by Leon



Technological achievements such as missiles pose new manufacturing and quality-control problems that place a premium on creative engineering.

Automation is one way of increasing productivity. Complex automated lines require more engineers and technicians who must be trained now.

Laux. A year before the delivery of the machine all personnel involved in operations to be performed on the new machine were given a thorough indoctrination. This was necessary because practically every step from making the original blueprint through production is different than when conventional control methods are employed. The existing system of dimensioning engineering drawings, for example, was completely altered to permit a more rapid translation of dimensions into numerical control data.

Once the machine was in successful operation, it was found that maintenance procedures were different than for a conventional machine. At present, 30 to 60 minutes are spent each day for preventive maintenance prior to production operation. The preventive maintenance program consists of running test tapes that bring all phases of the machine control unit into operation. Other checks are also run to determine if any electronic components have failed or are weak. These tests lessen down time for repair and possibly prevent later running a scrap part due to failure of a component of the control unit during production.

Machine alignment checks are also performed periodically, since any misalignment will be reflected in the workpiece. Misalignment cannot be compensated for by the operator, as is the case with conventional machines.

Offsetting the time required for preventive maintenance and checking is the fact that it is possible to use extremely high feeds and speeds with the numerically controlled machine. Rough machining time on the first test part, an aircraft bulkhead, was reduced to less than one-quarter of the time required for conventional milling. Further, it appears that with a cutter and holding fixture of sufficient rigidity, tolerances can be held within 0.001 to 0.002 inch.

The advantages of numerical control—flexibility, higher part uniformity, lower tool costs and better machine utilization—will undoubtedly lead to many applications during the next few years. Tools and dies, prototype parts casting and forging cleanup are all representative applications for this technique. Blade shapes and parts designed by digital computer techniques are likely to be well-suited to processing by numerically controlled machines. All of these parts are usually produced in small quantities by manual methods at present and high precision is required in their manufacture.

Reducing Lead Times: Numerical control has been successfully utilized to reduce manufacturing lead times. The Autonetics Div. of North American Aviation, Inc. for instance, has applied its Numill control system to a standard Cincinnati Hydrotel without machine modification. This numerically controlled machine is used to fabricate templates for tracer-controlled milling machines. It is also capable of many other types of work.

Control tapes are produced automatically. The tapemaker determines basic part drawing dimensions, formulas, coordinates, sequence of operations and tolerances desired. This information is put into a computer by punched card and a control tape is automatically produced. The computer calculates the straight line approximations of the

cutter path required to machine the desired shape to the required accuracy. It also figures speeds and accelerations for the cutter. The completed tape consists of blocks of data in number form.

The machine control converts the number data into appropriate command pulses, each of which drives the machine table 0.0005 inch. A digital gage senses all actual movement of the table and translates each 0.0005-inch movement into electrical pulses as a check to insure that commands are carried out properly.

Savings possible through using tape control and automatic tape programming are illustrated by production of a pair of profile mill fixtures. Size of the fixtures was 60 inches long, 12 inches wide. The fixtures were of 5/8-inch thick steel and tolerances were as small as 0.002 inch. Profile fixtures are usually produced in these steps:

1. Template fabrication
2. Layout
3. Rough bandsaw
4. Drilling and filing.

The last step, drilling and filing, takes nearly three-quarters of actual fabrication time. In this case, template fabrication took 15 hours; layout required 5 hours; rough bandsawing took 4 hours; drilling and filing time was 160 hours. Twenty percent of total production time was required, on the average, for scrap and rework, amounting to an average of 34 hours per pair of fixtures. This

The "hardware head"—the man who can build and repair machines or make prototype models of new products—is a key figure in our expanding economy.

brought total working time to 218 hours per pair.

Only three steps are required for production by tape control:

1. Tape planning
2. Computing
3. Setup and machining.

Tape planning took six hours, computing was accomplished in 10 minutes and machining time, including setup, was six hours. Total time was 12 hours and 10 minutes, reducing lead time from 27 8-hour working days to less than two days.

Although tape control has significant advantages for complex milling operations, it should be pointed out that fully programmed control also has several distinct disadvantages. Certain workpieces, for example, may have unpredictable responses during machining. Relief of internal stresses during cutting may cause the part to deform, for instance—a possibility that cannot normally be taken into account during tape preparation. Similarly, "hard spots" may cause unforeseen difficulties. For such applications, manual control or tracer control, closely monitored by an operator, may be the best solution. Feedback devices to take into account workpiece response are, perhaps, one possible answer, but such devices add more elements to already-complex control systems.

Machine Flexibility: Perhaps the most common applications of tape controls during the next few years will be to the simpler types of machine operations, particularly where a wide variety of similar parts are processed. For such applications, conventional automation is not feasible, yet a real need exists for automatic control. Engineers at General Electric Co., for instance, have designed and built a tape-controlled coil-winding machine and a tape-controlled drill press. The coil-winding machine is already in production use. The previous coil winding operation was semiautomatic. An operator dialed the number of turns and other pertinent information onto dials in a control panel. From the time the "start" button was pressed, the winding operation was machine-controlled. There was always, however, some possibility of operator error and the manual programming operation was time-consuming.

With the new control, which was designed for use in conjunction with the existing machine, all control information is programmed on a punched tape little more than one foot in length. Once the tape is inserted in the machine, the entire operation is carried out automatically with no possibility of error.

The General Electric-built drill press is controlled by a standard eight-channel punched tape. It is intended primarily for drilling and tapping holes in the end shells of large electric motors. Since

most of these motors are "specials," it is not feasible to utilize multiple heads or special drilling and tapping machines. As in the case of the coil winding operation, setup time for manual operation is time-consuming and there is always a possibility of error.

The "automated" drill press is actually a standard turret-head design, somewhat modified for tape control. Indexing of the turret, downfeed of the tools and positioning of the worktable are all initiated by the tape. Thus the machine operator need only insert an appropriate tape in the control panel, set the workpiece in position on a fixture on the worktable and start the drilling and tapping cycle by pushing a button. Accuracy of hole location is well within the tolerances for the majority of production operations.

Machining Research

As already pointed out, "superhard" materials cannot be efficiently machined by conventional methods. Extensive experiments are required to find the answers to these machining problems. Present theories of metal cutting are inadequate to cope with these new problems. Although much fundamental work has been done in the field of metal-cutting research for the past forty to fifty years, the emphasis has been on solving problems of immediate practical concern. As a result, there are significant gaps in metal-cutting theory. Predictions as to tool life, the effects of cutting angles and the most satisfactory speeds and feeds can be made on the basis ot current metal-cutting theory, but these predictions are not always supported by actual testing. According to Dr. W W Gilbert, who is in charge of machining research for the General Electric Co., basic research with a view to developing a mathematical theory of metal-cutting that takes into account all possible variables is essential for further progress.

The need for metal-cutting research has been recognized by many groups. The ASTE Research Fund, for instance, is supporting a survey of the present knowledge of metal-cutting with a view toward finding those areas where further research will pay greatest dividends.

Current studies under this program suggest that there is a need for developing an accurate method of calculating tool face temperatures; for investigating the basic factors causing tool wear; and for determining the exact nature of the shear process. Present knowledge of the mechanism of formation of the chip at the shear plane, in terms of stresses, geometry and the relative velocity of the tool work combination appears to be inadequate. Due to the dubious nature of the various assumptions that are made relative to the distribution of forces on the tool, on the chip and on the workpiece, there is poor agreement between theory and experiment for the so-called "shear angle relationship." This relationship, however, affects cutting accuracy, tool wear, power requirements and other factors. If it were better understood, over-all costs of metal-cutting in the U. S. would be substantially reduced.

Summer employment makes it possible for students to supplement engineering theory with practical first-hand knowledge of plant operations.

Leaving aside questions of theory, much work remains to be done on the practical side of metal-cutting. Ceramic cutting tools are a case in point. Although the high productivity of ceramic tools has been repeatedly demonstrated in the laboratory and under shop conditions, their potential has not been fully exploited in most plants. To get the most out of ceramic tools, it may be necessary to beef up or modify a machine to eliminate vibration and chatter. Once satisfactory cutting speeds have been achieved, the gain in productivity may be lost unless provisions are made for fast tool changes, since, at the extremely high cutting speeds possible with ceramic tools, tool changes are frequent. There is some tendency to dismiss the possibility of using ceramic tools after only sketchy trials under existing production conditions. What is needed, generally speaking, is a more scientific approach to the introduction of ceramic tools in the plant.

Faced with cutting problems caused by harder materials, excessive material waste through chip making and similar problems, many tool engineers are taking a look at "chipless" machining processes. Power roll-forming, in which cylindrical or conical shapes are formed from flat or preformed stock, has given good results in the production of tubing, jet engine components and such prosaic items as stainless-steel vacuum bottles. Precision casting of turbine blades to close tolerances has become a production reality, often eliminating virtually all machining operations. Cold extrusion methods, too, can eliminate or minimize machining. During the next few years, tool engineers will have to exploit all of these methods to cut costs.

The Basic Problem—Education

In the final analysis, the basic problem of tool engineering is a human problem. The demands of the next few decades for greater productivity cannot be met unless there is a greater number of tool engineers. Writing in a recent issue of *Harvard Business Review*, economist Eliot Janeway pointed out that:

"It is all very well for industry to continue scrambling for new crops of Ph.D.'s. They are needed; and they will continue to be needed for some years to come. But before industry can fully pay itself out on its investment in the last decade's crop of Ph.D.'s, it will have to concentrate for a very full decade on production engineering personnel, too. It will have to give this personnel more money as well as the perquisites that go with more money nowadays—status and security."

The current engineering shortage has been widely publicized and some steps are being taken to train more engineers. Even more work must be done on this problem in the next few years. Advanced automation, tape controls, machining research and dozens of other specialized fields of tool engineering will require a host of specialists.

Even with an adequate staff of tool engineers, it would be impossible for any company to maintain production without a staff of maintenance men for electrical, electronic, hydraulic and machine repair, plus tool and die makers, pattern makers and personnel with training in a host of other essential skills. According to Ernest Krause, vice president of Brooks and Perkins, another critical shortage in industry, today and in the foreseeable future, is the shortage of what he terms "hardware heads"—that is, men who have the necessary training and manual skill to build or repair machines, tools and custom workpieces. A certain proportion of such individuals graduate from trade schools. Most, however, are trained on job through apprentice programs. The scope and size of such programs must obviously be increased to keep pace with long-range production trends.

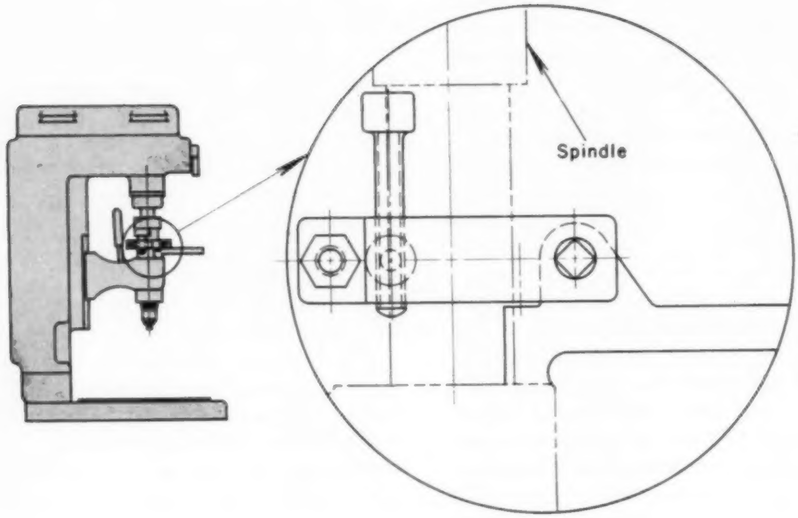
It is a common belief that the best tool engineers are those who have a practical "hardware-head" background plus a knowledge of basic engineering fundamentals. This combination is hard to find. Considering the amount of fundamental theory that must be taught in the average four-year college engineering course, it is unreasonable to expect any great emphasis on practical shop courses, such as machine-shop work. At the same time, in view of the shortage of engineers, lengthening the engineering course to five years to include practical courses is undesirable.

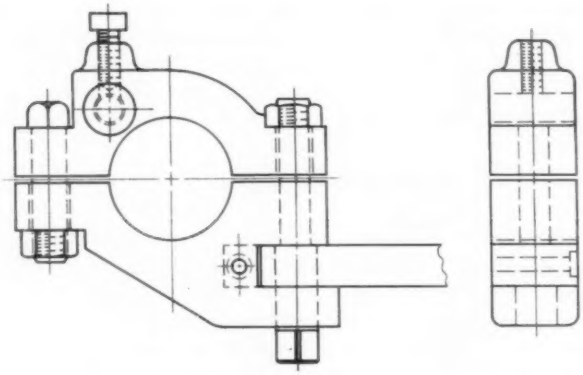
One solution to the problem is summer employment of engineering students by industry. Training and experience in actual shop operations during summer employment can pay big dividends. This has been demonstrated by the program conducted by the National Bureau of Standards for the past several years. Incidentally, a substantial percentage of students employed under the program ultimately accept full-time employment with the Bureau after graduation, illustrating the long-range recruiting values of summer employment. Further, graduates who have had summer training do not require lengthy indoctrination periods; they can be put right to work.

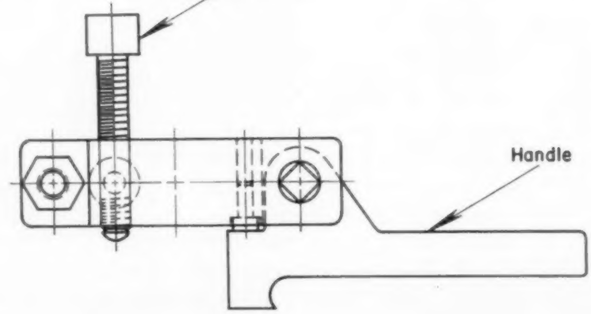
To summarize, the long-range problems of tool engineering—obtaining greater productivity, overcoming engineering and manpower shortages, and coping with radically new products and product materials—are by no means insoluble. The growth of tool engineering as a profession will parallel the growth of industry as a whole during the next several decades and new manufacturing problems will be solved by more effective engineering.

Gadgets

Ingenious Devices And Ideas To Help The Tool Engineer In His Daily Work







Two-Station Drill Spindle Stop

Ouite often, parts are designed with drilled or reamed holes of the same diameter but of different depths. Normally, a different drill spindle is utilized for each operation.

The two-station drill spindle stop shown makes it possible to use the same spindle for machining two holes of the same diameter but of different depths. Changeover from one hole depth to another is accomplished by moving the handle up or down.

This type of stop makes the use of loose spacer blocks unnecessary, resulting in faster operation with little possibility of operator error. When a large number of holes are to be machined in one workpiece, the stop reduces the amount of handling required, thus helping to keep costs down.

W. R. Eldridge
Little Rhody Chapter

Grinding Cams on a Lathe

Cams can be accurately ground using a conventional tool post grinder mounted on the compound of a lathe. The cam is mounted on the spindle of a gear reducer secured to a bridge across the lathe bed. The reducer is driven from the lathe spindle through a short shaft and flexible coupling arrangement. If the input shaft of the reducer selected cannot be lined up with the lathe spindle, a universal joint can be used as a coupling.

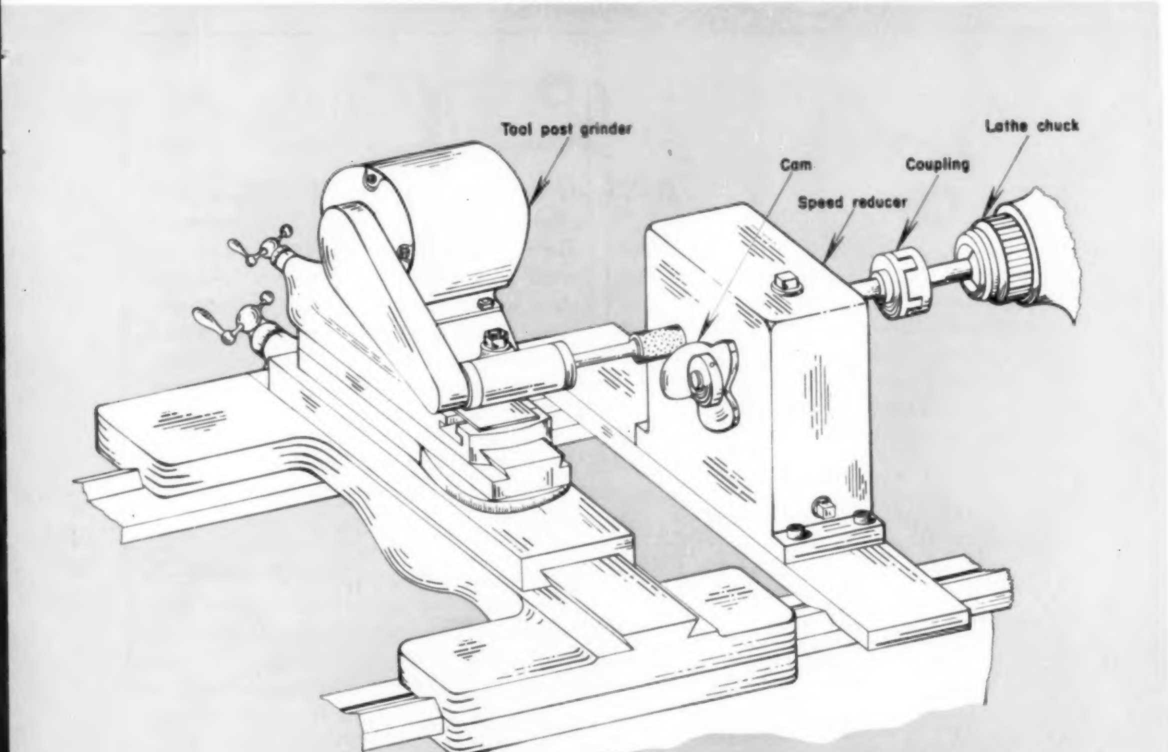
In operation, the cam is rotated slowly and the grinder is fed toward the work by the cross power feed. The cross feed is driven through a clutch, so it is best to grind while feeding in toward the work. Clutch slippage while feeding in will result in an oversize cam; clutch slippage while feeding out will cause the work to be ground undersize.

Rate of rise of the cam is determined by the gearbox ratio and the lathe feed settings. Any one gearbox will give as many rates of rise as there are cross feeds on the particular lathe. For example, if the gearbox ratio is 100:1 and the feed is set at 0.020 ipr, the rate of rise (0.020 x 100) is 2.00 ipr, or 0.0056 inch per degree of rotation.

When a particular rate of rise cannot be obtained with a specific gearbox-cross feed combination, a special gear can be placed in the lathe feed train, or extra gears or a chain drive can be used at the input end of the gearbox.

The setup described gives excellent performance in production. It is used primarily for screw machine cams but is also suitable for other types of circular cams.

Clint McLaughlin
Rockaway Beach, N. Y.



Lap for Lead Screws

To make accurate lead and feed screws for special machines, often it is necessary to overcome slight errors in lead, which may be caused by temperature variations in the work. These errors can be corrected with the lapping device shown. It is threaded onto the work and run back and forth over each area to be corrected.

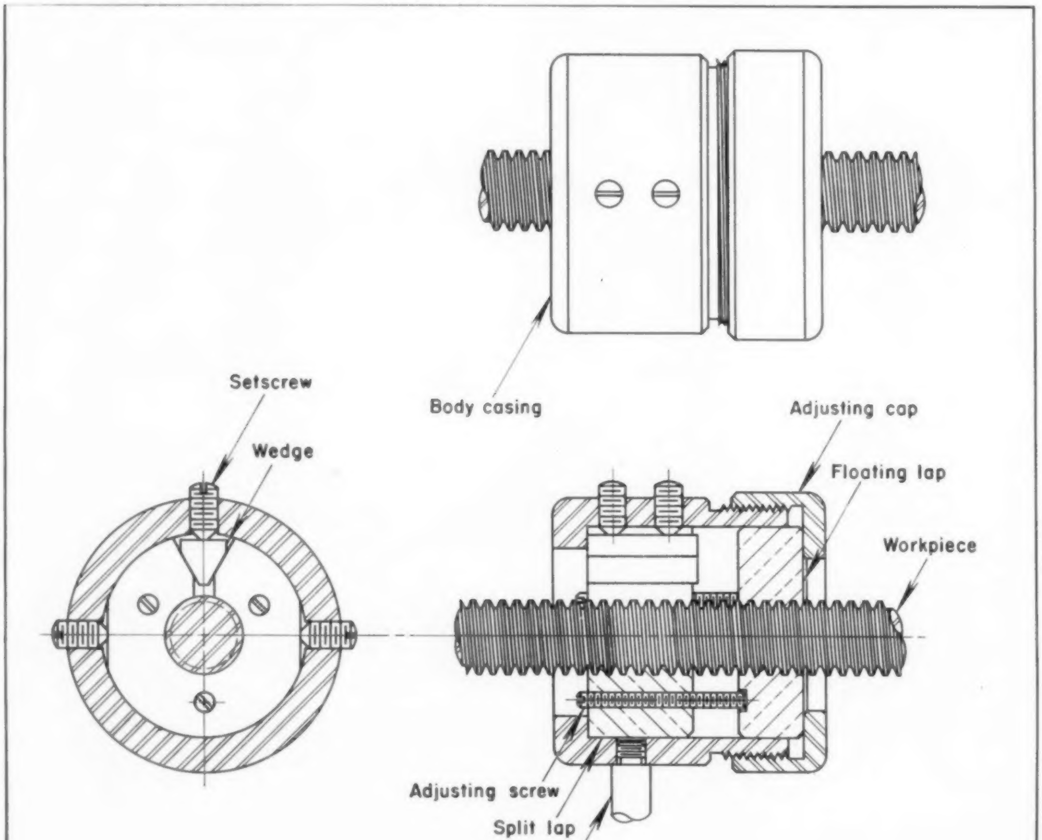
The lapping head consists of a body casing containing two bronze laps. One of the laps is split for snug adjustment to the thread; the other is not split and is intended to follow as a floating lap.

The two laps are separated by three adjusting screws. If correction for long lead is desired, the laps are forced together by tightening a threaded adjusting cap and loosening the three screws. This allows material to be removed from the outer opposed flanks of the threads. For short lead correction, the adjusting cap is loosened slightly and the screws are tightened so that the laps bear against the inner opposed flanks of the thread.

A wedge fits into the opening of the split lap. The lap can be tightened or loosened on the work by adjustment of setscrews, retracting or advancing the wedge. One or more handles are threaded into the body casing to prevent rotation of the tool while the work is revolving in the lathe. The handles may also be used to turn the laps manually.

In operation, the laps are charged with a fine lapping compound, approximately 500 grit size. A large quantity of light oil is run on the workpiece during lapping. In addition to correcting short lead and long lead conditions, the tapping head corrects minor faults in thread form and surface finish.

H. J. Gerber
Member-at-Large
Stillwater, Oklahoma



High-Speed Cutting

with ceramic tools

By H. J. Siekmann*

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This and the following articles are abstracted from papers to be presented at the 1958 ASTE Annual Meeting, Philadelphia, May 1-8. These papers, covering tooling for metal cutting and metal and plastics forming, are typical. Speakers at the meeting will cover many other topics of equal significance to tool engineers who must plan "Tooling for Competition."

WITH THE DEVELOPMENT of improved forging, casting and welding methods, resulting in the processing of metals close to finished size, the trend in metal-cutting has been to lighter cuts. At the same time, there has been a continuing demand for higher productivity in metal-cutting operations.

These trends have created great interest in ceramic (cemented oxide) cutting tools. Ceramic tools function best when making light cuts and they are much more productive than cemented carbide cutting materials. Until recently, however, there has been little information available on the characteristics of ceramic tools over a wide range of cutting conditions. One of the most frequent questions concerns the effect of tool geometry, feed and other cutting conditions on tool forces at the extremely high speeds possible with ceramic tools.

Test Conditions

To find out some of the answers, General Electric Co. engineers are conducting a series of machinability studies, using a special high-speed, high-horsepower lathe, *Fig.* 1. This 150-hp lathe has variable speed control, making it possible to maintain a constant cutting speed as successive cuts are removed from the work material bar. Speeds range from 250 to 5000 rpm. At the maximum rpm, cutting speed on a 14-inch-diameter workpiece is more than 18,000 fpm.

Instrumentation includes devices to allow the remote indicating of surface speed continuously,

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Abstracted from Paper 82, "The Use of Ultra High-Speed 150 Horsepower Lathe for Machinability Studies," to be presented at the 26th Annual Meeting. Copies of the complete paper will be available for purchase from Society Headquarters.

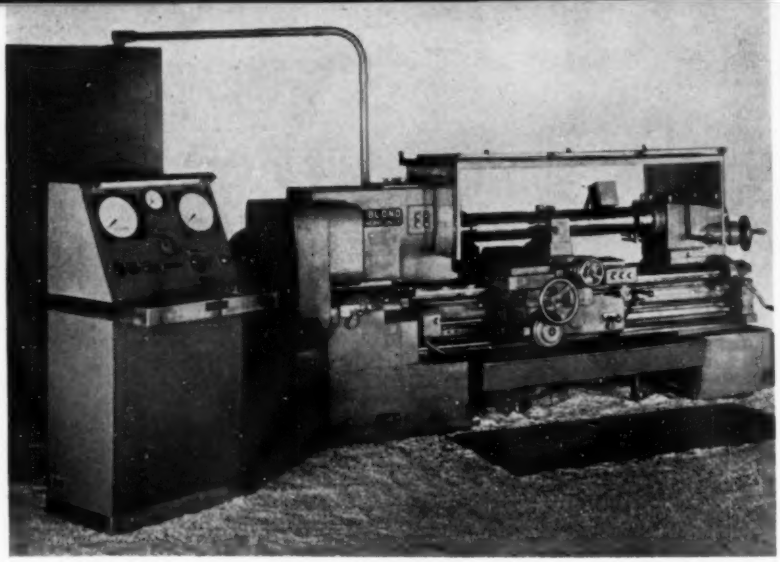
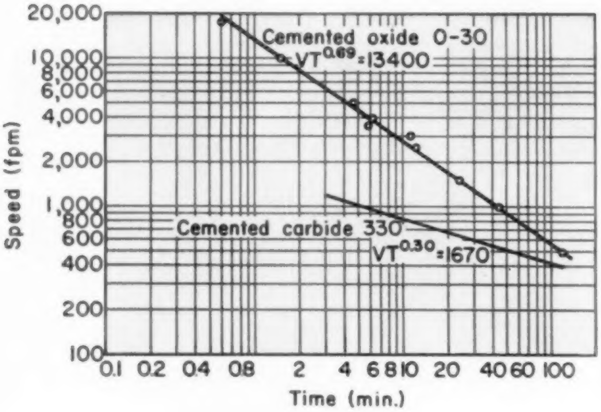


Fig. 1. (right) High-speed lathe used for ceramic tool cutting studies. On left are remote operator's control panel and drive control cabinet.

Fig. 2. (below) Tool life of carbide and oxide tools. Feed 0.010 ipr. Depth of cut 0.100 in. Slope of line representing cemented oxide is 0.69.



as well as remote control of the lathe speed. The testing technician can thus regulate the speed from a control panel without the need for checks with a hand tachometer. To aid in tool life determinations, a length-of-cut timer is installed in the control panel. Overload conditions are indicated by a light on the control panel.

During remote operation, the activities of the cutting tool are monitored through the use of a three-component force dynamometer. Excessive wear or chipping is quickly detected. Speed and forces under all conditions are recorded on a four-channel oscillograph.

The tests to be discussed were conducted on AISI-1045 steel in the normalized condition with a hardness range of 170-180 Bhn. Most tests were conducted on bars four feet long and eight inches in diameter, giving a maximum speed of 10,000 fpm at 5000 rpm. Tests in the 18,000-fpm range were conducted on a 14-inch diameter bar, also four feet long.

Two common tool geometries were used. The tool geometry found on a standard brazed "B" style carbide tool of 0-deg back rake, 6-deg side rake, 6-deg relief angles, 15-deg end cutting edge and side cutting edge angles, and 1/16-inch nose radius was compared to 1/2-inch square disposable inserts having —5-deg back and side rakes, 5-deg relief angles and 15-deg end and side cutting edge angles. All tips were lightly honed to produce a 0.002-0.003-inch 45-deg flat on the cutting edge. Observation of the worn cutting edge was conducted with a toolmaker's microscope, using a 40X magnification.

Test Procedure

For testing, the oscillograph was arranged to record vertical, radial and horizontal forces of the cutting tool, as well as cutting speed. The cutting tool was fed into the work immediately after the start button was depressed. Thus, the tool entered the cut as the speed rose to about 1000 to 2000 fpm. This speed increased to 10,000 fpm in about 10 seconds. Subsequent checks showed that data obtained in this way is applicable to constant cutting conditions.

In tests at 17,000 to 18,000 fpm, the rate of wear was extremely high. Due to the short time required to obtain these speeds and immediate retraction of the tool there was little wear at the cutting edge.

Tool life tests were based on 0.012-inch flank wear. It was found that frequent breakage is encountered when flank wear exceeds 0.015-0.020 inch under the feed and depth of cut used for testing. Chip samples were taken at all speeds tested to enable the measurement of chip thickness. Chip breakers were not employed except for low-speed tool life tests at 500-1000 fpm, where feed and speed alone were not sufficient to break the chip.

Test Results

Results of the tests showed that the tool life for minimum cost for ceramic tools is much less than

that for carbide tools. In plotting the log of tool life versus the log of cutting speed for cemented oxide, *Fig* 2, it can be seen that the slope of the line is 0.69. Using the Taylor formula, $VT^{0.69} = 13{,}400$ for ceramic tools, as compared to $VT^{0.30} = 1670$ for carbide tools. The data appears to form a straight line between 500 and 18,000 fpm, which tends to support the thinking that this relationship is a straight line above 100 fpm.

Where T_c is the tool life for minimum part cost, n is the slope of the tool life line, t is total cost of the cutting edge (including cost of changing the tool, regrinding the cutting edge and depreciation of a brazed tool or mechanical holder), M is the machine labor and overhead rate, and TCT is tool changing time, minimum cost cutting speed can be determined with the following formula:

$$T_c = \left(\frac{1}{n - 1}\right)\left(\frac{t}{M} + TCT\right)$$

Assuming that the quantity $(t/M + TCT)$ is a constant for one particular operation, the quantity $(1/n - 1)$ is 2.33 for carbide and 0.52 for cemented oxide, indicating that tool life for minimum cost for ceramic tools is less than one-fourth that for carbide. For a given cutting operation with a carbide tool, assuming a minimum cost tool life of 40 minutes, the cutting speed would be approximately 550 fpm. Minimum-cost tool life for a ceramic tool under the same conditions would be nine minutes, requiring a cutting speed of 3000 fpm.

Comparing the effect of speed on tangential force, *Fig*. 3, it can be seen that carbides have a slightly greater force than oxides for a given size of cut at a given speed. This slight difference has been reported before, but has not been found to be as significant as was expected when ceramic tools were first introduced. As the speed is decreased, the forces mount rapidly, and oscillographic traces of the three forces become extremely erratic below a given speed. It was found that cemented carbide grade 350 exhibited erratic force traces below a speed of 90 fpm (472 lb vertical force).

Force traces for grade 0-30 ceramic tools became erratic below 42 fpm (444 lb vertical force). This tends to support the conclusion that the effect of built-up edge on the forces at low speed occurred at a somewhat lower speed for cemented oxide than for cemented carbide. Perhaps this is due to the lower tendency for adherence between the work material and the tool material. Further work will have to be carried out to establish the reliability of this conclusion.

At high cutting speeds, the forces level out at approximately 5000 fpm under the conditions tested. Tests were carried out increasing the speed to 15,000 fpm at 0.005 ipr feed with no change in force. Checks at 17,500 fpm tend to confirm the flatness of this line for 0.010 ipr feed. Within the range of speeds tested, there seems to be little indication that forces would drop off and tool life increase at some extremely high cutting speed. Vertical force versus speed data in the lower speed range tends to substantiate data published by A. O. Schmidt, covering tests conducted on low carbon tubing under orthogonal cutting conditions with ceramic cutting tool materials.

Data on chip thickness and chip contact width, *Fig*. 4, indicate that the drop in forces due to increase in speed did not reduce the unit pressures on the cutting edge to any great extent. This is unfortunate, since the oxide materials are relatively weak and would benefit by a reduction in the unit pressure on the cutting edge. The decrease in the chip thickness with 0.010-ipr feed indicates an in-

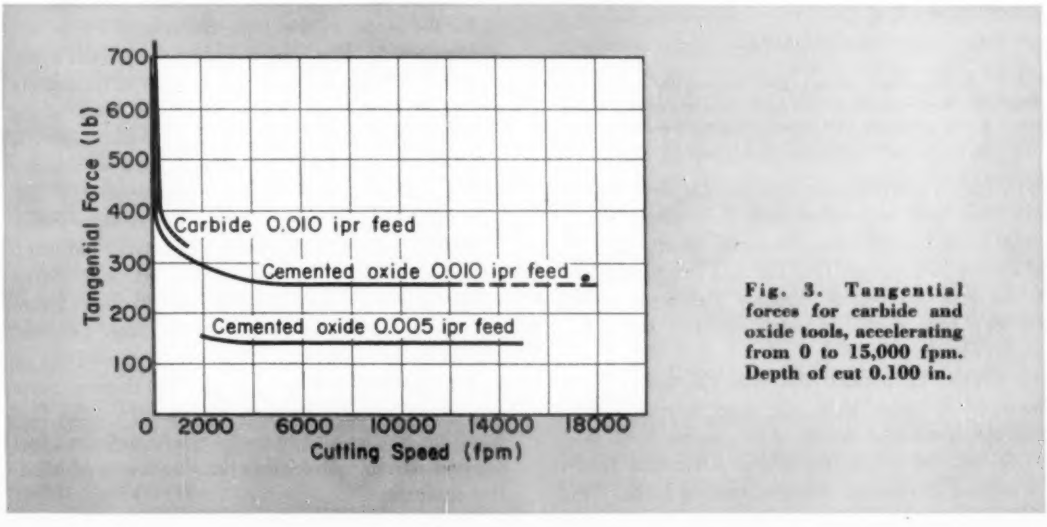


Fig. 3. Tangential forces for carbide and oxide tools, accelerating from 0 to 15,000 fpm. Depth of cut 0.100 in.

crease in the chip thickness ratio and a corresponding increase in the shear angle up to around 4000 fpm. Beyond that there does not seem to be any perceptible change.

Comparing the three components of tool force at various speeds for the three tool geometries under feeds of 0.002 ipr, 0.005 ipr, 0.010 ipr and

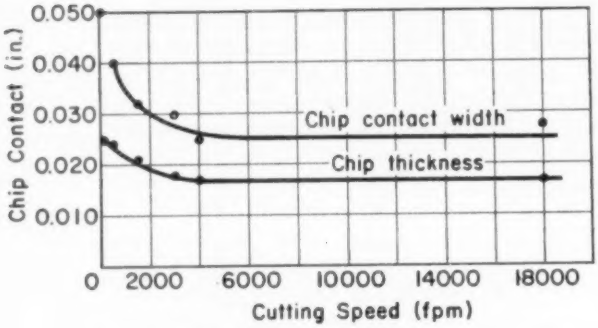


Fig. 4. Chip thickness and contact width drop as speed is increased in the low-speed range at about the same rate as forces drop, reducing any major change in chip contact pressure.

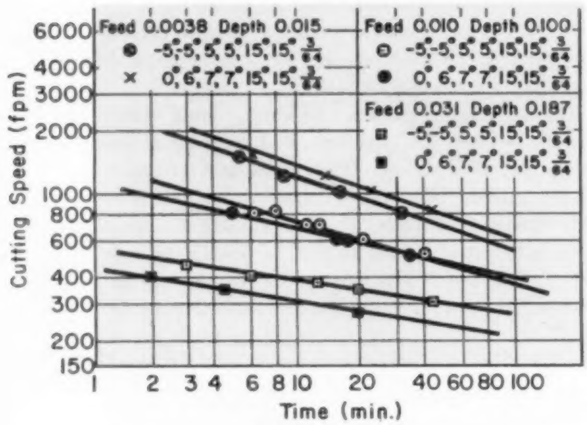


Fig. 5. Comparison of negative disposable insert geometry to that found on standard brazed carbide tools under light, medium and heavy cutting conditions.

0.015 ipr, it can be seen that the higher negative rake tools tend to require more horsepower at the lower feeds, but appear to be more advantageous in the higher feed range. Tool life data comparing two of the tool geometries indicate the same trend. Negative rake angles increase tool life under the heavier feed condition.

It should be pointed out that the radial force measured in these tests was considerably higher than the horizontal force. Also, under light feed conditions, the radial force and horizontal forces are a good portion of the total cutting force. This indicates that the large nose radius ($\frac{1}{16}$ inch) relative to the depth of cut (0.100 inch) is causing large radial force. Although this may not be considered desirable, tool life data on the effect of tool geometry indicate that large nose radii and high lead angles are highly advantageous.

A plot of the horsepower per cubic inch per minute versus feed indicates a typical drop-off from low feeds at both 2500 fpm and 6000 fpm, *Fig.* 5. Cuts taken at 18,000 fpm, 0.100-inches depth and 0.010-ipr feed required approximately 175 hp, as measured by the horsepower meter on the instrument panel. Calculation of horsepower at the cutter indicated a requirement of 145.3 hp; thus, an efficiency of the lathe of 83 percent. With the lathe under a 50-hp load, the dynamometer indicated 48.7 hp at the cutter for a 97.4 percent efficiency of the lathe under these conditions. It appears that the direct drive gives good efficiency for machine tools at these speeds.

Conclusions

Due to the physical properties of the ceramic or cemented oxide materials, the higher negative rake tools have been found to give longer tool life and more reliable cutting performance. Cutting tests have been conducted on very hard steels with negative rakes as high as 30 deg with optimum results. These high negative rakes have been considered detrimental due to the high forces incurred. The preceding data indicate that the forces incurred with the higher negative rakes are not enough higher than the positive rakes to warrant consideration and, in fact, under higher feed conditions, appear to be lower than the positive rake tools. Over a speed range from 0 to 18,000 fpm, the cutting forces drop rapidly as speed is increased above zero and show a fair amount of reduction through the carbide speed range. Beyond 4000 to 5000 fpm, there appears to be little effect of speed on cutting forces.

As the slope of the tool life line ($VT^n = C$) approaches 45 deg (or $n = 1$), we approach a cutting tool material which can be run at extremely high speeds very economically. This fact, along with the continued rise in the cost of manpower, is an incentive to develop machine tools which can operate at these high speeds and automation equipment to match the high production rates possible.

These machine tools must be capable of high spindle velocity, must be equipped with large horsepower capacity drives and, although forces are not great at these high speeds, must be rigid and free from vibration. Not only is machining at high velocity economically sound, but there appears to be every reason to believe that newer cutting tool materials will be able to perform with sufficient tool life and reliability to enable their use on production line equipment.

There is a mathematical relationship between chip compression, the coefficient of friction and tool rake angles. This makes it possible to calculate cutting forces without dynamometer measurements.

effects of chip compression on cutting forces

By Max Kronenberg*

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THERE ARE MANY VARIABLES in metal-cutting operations. For purposes of simplification, some of these variables are ignored in metal-cutting theory. For instance, in deriving equations for the cutting force and shear angle, based on stress analysis, it is customary to consider the chip as a stationary body in static equilibrium. The resultant cutting force R, *Fig.* 1, is usually resolved into three systems of force components: (1) the main cutting force P and the feed force P_2; or (2) the friction force P_t, and the normal force acting perpendicular to the tool face P_n; or (3) the shearing force P_s and the compressive force P_d.

When a chip passes over the tool face, its velocity is reduced by friction. The cutting tool acts as a brake on the chip, reducing its speed greatly, often to less than half the cutting speed. During deceleration, the chip is compressed. This deceleration is not taken into account when the chip is considered as a stationary body.

It is possible, however, to develop a cutting formula that includes the dynamics of chip flow, using d'Alembert's principle.

Derivation: This principle states that the equation for a system of particles can be obtained by considering the conditions of equilibrium of the static forces, together with the inertial or dynamic forces acting on the particles. It is not necessary to consider internal stresses. When a system is subjected to a change in velocity and is also moving along a curvilinear path, which is the case when chips are decelerated and change direction at the cutting edge, two dynamic forces, plus static forces, must be taken into account.

For the purpose of deriving the equation, the conditions can be somewhat idealized as shown in *Fig.* 2. It is assumed that the chips flow from the direction indicated by the "cutting speed" arrow, v, to the direction indicated by the "chip velocity" arrow, v_c. The chip is acted upon by the normal force and the friction force and by two dynamic forces. The first dynamic force opposes the friction force. It can be determined from the formula:

$$m\frac{dv}{dt} = -P_t = -\mu P_n \qquad (1)$$

Here, dv/dt is the first derivative of the velocity with respect to time. It takes the chip deceleration into

***Senior member ASTE Cincinnati chapter.**

Abstracted from Paper 86, "A New Approach to Some Relationships in the Theory of Metal-Cutting," to be presented at the 26th Annual Meeting. Copies of the complete paper will be available for purchase from Society Headquarters.

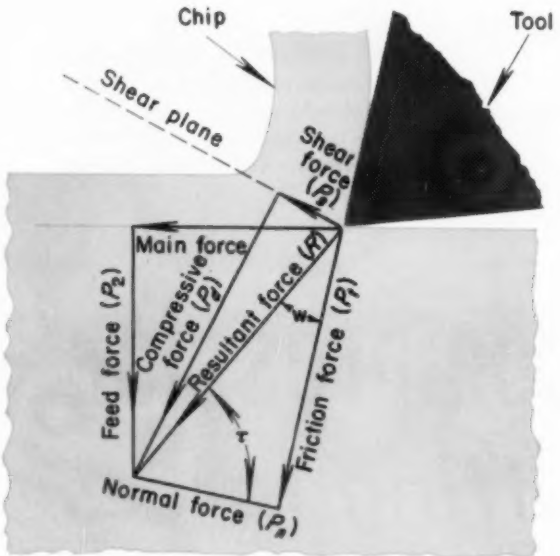


Fig. 1. Force systems involved in metal-cutting.

account. The symbol m represents mass of the chip and μ is the so-called coefficient of friction.

A second dynamic force acting on the chip is centrifugal force. This force is balanced by the normal force. It can be expressed mathematically:

$$m\frac{v^2}{r} = P_n = mv\frac{d\theta}{dt} \qquad (2)$$

where $d\theta/dt$ is the angular velocity of the deflected chip and r is the radius of curvature. Substituting Equation 2 into Equation 1:

$$m\frac{dv}{dt} = -\mu mv\frac{d\theta}{dt}$$

Transposing v to the left side and integrating with limits v and v_c gives:

$$\frac{v_c}{v} = e^{-\mu\theta} \qquad (3)$$

where e is the natural logarithm base and angle θ is $\pi/2-\alpha$. The symbol α represents the rake angle. Hence:

$$\frac{v_c}{v} = e^{-\mu(\pi/2-\alpha)} \qquad (4)$$

Another well-known relationship between cutting speed and chip velocity can be used to include the chip compression factor, λ:

$$\frac{v_c}{v} = \frac{1}{\lambda} \qquad (5)$$

Hence, the chip compression factor can be represented:

$$\lambda = e^{\mu(\pi/2-\alpha)} \qquad (6)$$

This equation establishes a direct relationship between the chip compression factor, the apparent coefficient of friction and the rake angle.

A graph of Equation 6, *Fig.* 3, permits determination of either the coefficient of friction or the chip compression factor for any of the rake angles represented. Based on the curves, the following conclusions can be drawn:

1. For the same true rake angle, the coefficient of friction increases when the chip compression increases.
2. Chip compression increases as the resultant cutting force R approaches the tool face, i.e., as angle w, *Fig.* 1, decreases.
3. Chip compression increases when the true rake angle decreases, regardless of a change in the apparent coefficient of friction, except in extreme cases.
4. When the friction is zero ($\mu = 0$) the chip is not compressed ($\lambda = 1$).

Shear Angle: Equation 6 can also be used to determine a direct relationship between the coefficient of friction and the shear angle, φ, for various true rake angles, *Fig.* 4. Substituting Equation 6 into the shear angle equation* yields:

$$\tan\varphi = \frac{\cos\alpha}{e^{\mu(\pi/2-\alpha)} - \sin\alpha} \qquad (7)$$

Equation 7 can be converted into the approximate formula:

$$\varphi = 45 + \frac{\alpha}{2} - \tau(0.75 + 0.0045\alpha) \qquad (8)$$

where τ is the friction angle. Previous formulas for the shear angle, derived by stress analysis, are shown in the accompanying table. It is seen that discrepancies exist, depending upon the stress pattern assumed by the respective investigator. It seemed possible that a different approach, not requiring assumption of a stress pattern, might yield new answers to these problems. The application of d'Alembert's principle was tried.

A comparison between the results obtained with the new approach and the traditional approach is shown in *Figs.* 5 and 6. One thing suggested by the

***See the *Tool Engineers Handbook*, First Edition, page 306, Equation 4, where $r_c = 1/\lambda$.**

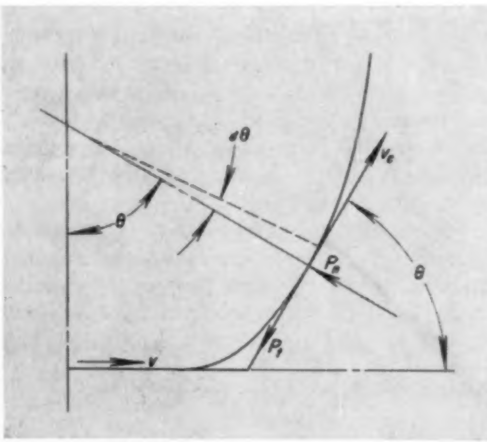


Fig. 2. Idealized conditions of chip flow. Chips flow in the direction indicated by arrow v, then upward as shown by arrow v_c.

graphs is that the machining "constant," C*, is a variable quantity. This variation of the machining constant with the chip compression factor can be computed using Merchant's equation:

$$C = \tau - \alpha + 2\varphi \qquad (9)$$

if the shear angle is substituted into Equation 9, and the friction angle is calculated from:

$$\tan \tau = \frac{\ln \lambda}{\pi/2 - \alpha} \qquad (10)$$

The results of these computations are shown graphically in *Fig. 7.* It will be noticed that C has a value of 90 degrees only when $\lambda = 1.0$; i.e., when the chip is not compressed. With increase in the chip compression factor λ, the value of C decreases, depending upon the magnitude of the true rake angle α.

Cutting Forces: The formula given in Equation 6 can also be employed to calculate the cutting force and its components after measuring the chip compression factor only. In the past, a direct determination of cutting forces has not been possible. It was necessary either to find the machining constant, C, from cutting tests or, alternatively, to measure the coefficient of friction experimentally. Hence, cutting forces had to be measured in order to calculate cutting forces. With the aid of the new formula, multipliers can be developed for cutting force computations of a material when the shear strength and the chip compression are known. No cutting force dynamometer measurements are needed.

Based upon free cutting, that is, when a tool nose is not in engagement with the work, as when turning the face end of a tube, multipliers have been determined which include the chip compression factor, leading to the following equation of first approximation for the main cutting force P:

$$P = S_s \, . \, f_n \, . \, d \, \frac{\lambda \cos(\tau - \alpha)}{\cos(\tau - \alpha + \varphi)} \qquad (11)$$

where S_s is the shear strength of the material, f_n is feed per revolution and d is depth of cut.

The fractional term is a multiplier designated by M. Transposing the chip cross sectional area to the left side of Equation 11, an equation is obtained for unit cutting force k_s—the cutting force per square inch of chip cross sectional area:

$$k_s = S_s M \qquad (12)$$

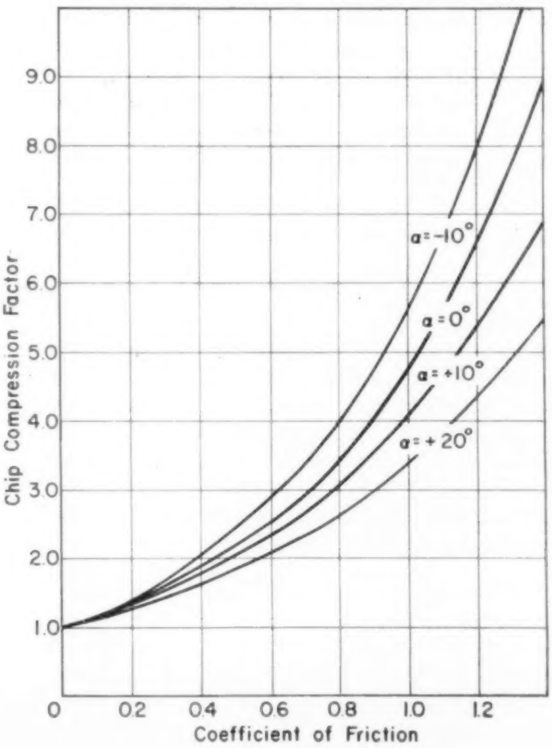
Hence, if the shear strength of the work material is multiplied by the value for M, the unit cutting force is obtained directly from the chip compression factor. The main cutting force itself can be computed by multiplying k_s by the dimensions of the chip.

As an example, the unit cutting force, k_s, equals 4.15 times the shear strength when the chip compression factor is 3.0 and the true rake angle is 0.

The feed force P_2 can be computed in first approximation with a multiplier:

*The *Tool Engineers Handbook*, page 312.

Fig. 3. Relationship between chip compression factor and coefficient of friction for four true rake angles.



Nomenclature

- C = machining "constant", deg
- d = depth of cut, inch
- e = base of natural logarithm
- f_n = feed per revolution, inch
- k_s = unit cutting force, psi (work done for unit volume of metal removed)
- M = multiplier used to calculate cutting force
- m = mass of chip element
- P = main cutting force, lb
- P_2 = feed force, lb
- P_d = compressive force, lb
- P_n = normal force, lb
- P_s = shear force, lb
- P_t = friction force, lb
- R = resultant cutting force, lb
- r = instantaneous radius of curvature
- S_s = shear strength, psi
- v = cutting speed, fpm
- v_c = chip velocity, fpm
- w = angle of resultant force, deg
- α = true rake angle, deg
- λ = chip compression factor
- μ = apparent coefficient of friction
- τ = friction angle, deg
- φ = shear angle, deg

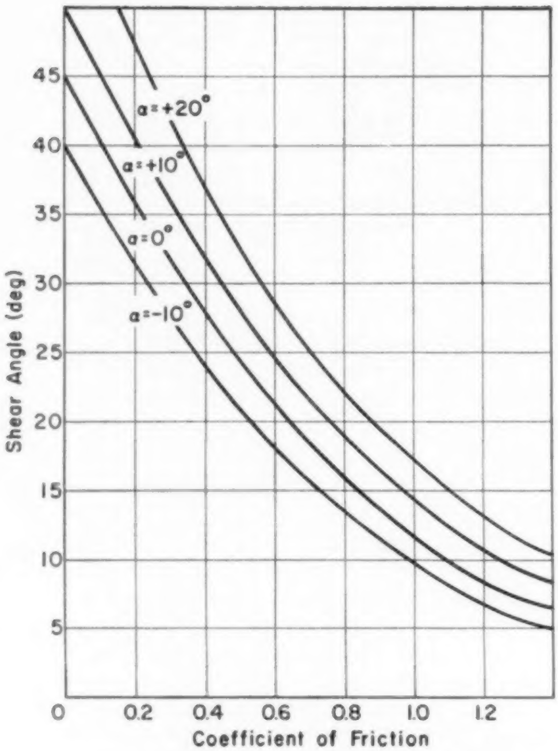
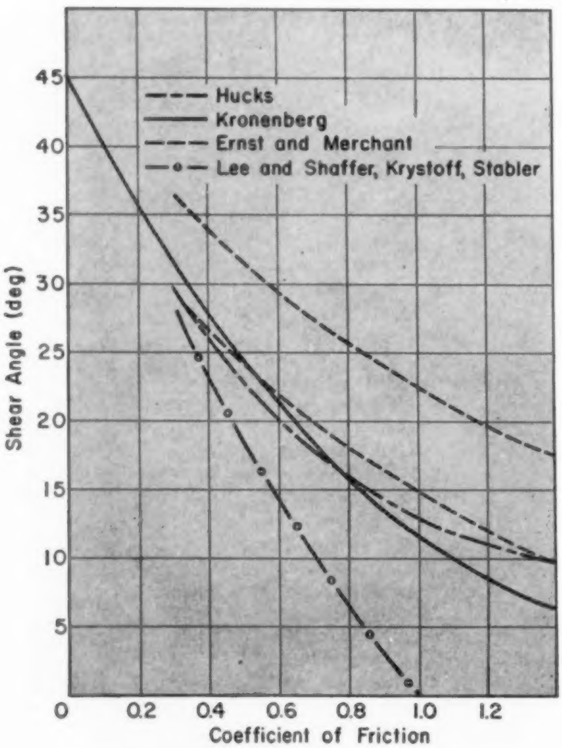


Fig. 4. Relationship between shear angle and coefficient of friction for four true rake angles.

Shear Angle Formulas

Herman	$\varphi = 90 - \frac{(90 - \alpha) + \tau + \tau_1}{2}$
Merchant and Ernst (1)	$\varphi = 45 + \frac{\alpha}{2} - \frac{\tau}{2}$
Merchant and Ernst (2)	$\varphi = \frac{C}{2} + \frac{\alpha}{2} - \frac{\tau}{2}$
Krystoff; Lee and Shaffer	$\varphi = 45 + \alpha - \tau$
Stabler	$\varphi = 45 + \frac{\alpha}{2} - \tau$
Hucks	$\varphi = 45 + \alpha - \frac{\tan^{-1} 2\mu}{2}$
Shaw and Cook	$\varphi = 45 + \alpha - \tau + \eta'$
Kronenberg	$\tan \varphi = \frac{\cos \alpha}{e^{\mu(\pi/2 - \alpha)} - \sin \alpha}$
Kronenberg (approximation)	$\varphi = 45 + \frac{\alpha}{2} - \tau(0.75 + 0.0045\alpha)$



$$M_s = \frac{\lambda \sin (\tau - \alpha)}{\cos (\tau - \alpha + \varphi)} \qquad (13)$$

It can be shown that the feed force will become negative for work materials having a low chip compression factor and machined with positive true rake tools. This phenomenon is known to lathe operators as "pulling of the tool." Reducing the true rake helps because the feed force is reversed from negative to positive and the tool will no longer be pulled into the work.

The friction force P_t, is obtained in first approximation from the following multiplier:

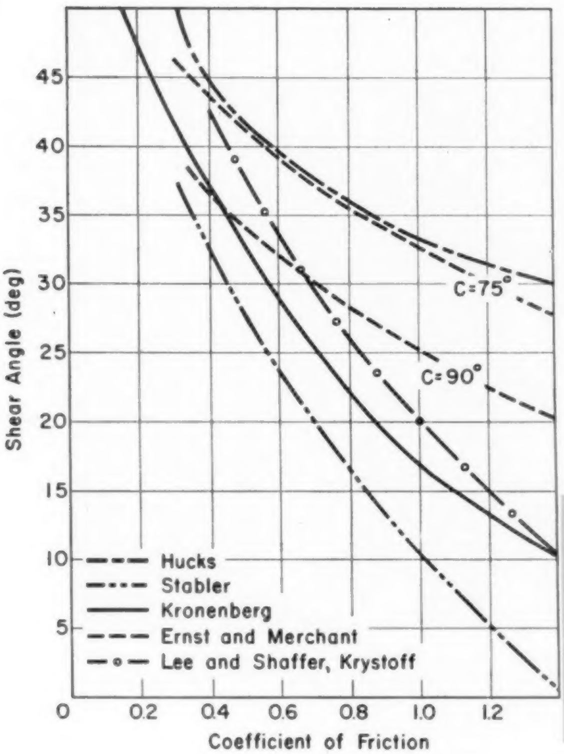
$$M_t = \frac{\lambda (\sin \tau)}{\cos (\tau - \alpha + \varphi)} \qquad (14)$$

Graphs show that the friction force is nearly constant or is little affected by the true rake within the common range of chip compression values (up to 3.0). This theoretical result agrees with conclusions derived from the practical tests carried out by Stanton and Heyde as early as 1925.

The normal force P_n, on the other hand, varies considerably with the true rake represented in first approximation by the multiplier:

$$M_n = \frac{\lambda \cos \tau}{\cos (\tau - \alpha + \varphi)} \qquad (15)$$

Fig. 5. (left) Relationship between shear angle and coefficient of friction for true rake angle of 0 deg, based on formulas of various investigators.



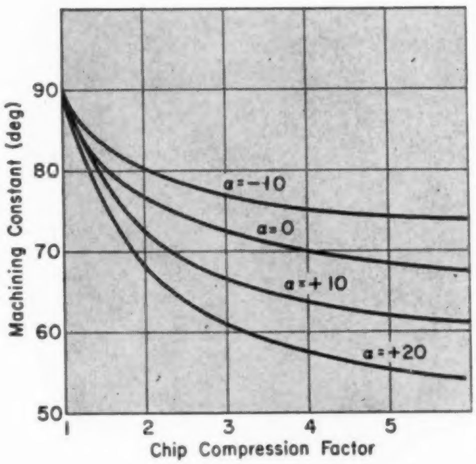


Fig. 6. (left) Relationship between shear angle and coefficient of friction for true rake angle of +20 deg, based on formulas of various investigators.

Fig. 7. (above) Relationship of machining constant and chip compression factor for different true rake angles.

The large theoretical change in the normal force agrees with the practical tests by Stanton and Heyde. Diagrams representing Equations 11-15 are found in the complete paper.

A comparison of graphs based on formulas 14 and 15 reveals that the normal force decreases more rapidly than the friction force. In the case of a chip compression factor of 3.0, the multiplier M_n drops from 5.0 to 4.1 when the true rake is changed from —10 deg to zero. The multiplier M_t for friction force drops only from 3 to 2.85. The apparent coefficient of friction for $\alpha = -10$ deg is $3/5 = 0.6$ and for $\alpha = 0$ deg it is $2.85/4.1 = 0.7$. It may thus appear as if a true rake of 0 deg is less desirable than a true rake of —10 deg because the coefficient of friction has increased from 0.6 to 0.7. Actually, conditions have improved, because both friction and normal forces have decreased. The normal force dropped faster than the friction force, giving the impression of worsened cutting conditions. It is thus incorrect to judge cutting performance by the coefficient of friction; hence the name "apparent coefficient of friction."

The change in the direction of the resultant cutting force, R, with respect to the tool face is of interest because angle w affects the tensile stress in the tool face. Excess tensile stress may be the cause for cracks in tool tips. This angle is the complement of the friction angle and follows from:

$$\tan w = \frac{\pi/2 - \alpha}{l_n \lambda} \qquad \text{(16)}$$

Before cutting force formulas were available, it was customary among machine tool designers to estimate cutting forces according to a rule of thumb. Under this rule, the unit cut force was assumed as two to four times the tensile strength of work material provided that continuous chips were produced. Assuming that shear strength approximates tensile strength, as is true in many cases, the rule of thumb indicates that a multiplier between 2.0 and 4.0 was recommended.

Multipliers within these limits are associated with chip compression factors of about 1.5 to 3.5, not considering negative true rakes, which were not used. From many tests, it is known that chip compression factors between 2 and 3.5 occur very frequently in practice. It may be concluded that the rule of thumb confirms the data derived here, although it admits cutting force inaccuracies of 100 percent.

It may sometimes appear as if a considerable gap exists between theory and practice. The extension of chip compression investigations to cutting force computations may help to bridge this gap.

NOTE: The relationship between cutting speed and chip velocity used in developing Equation 5 is covered more fully in the author's *Science and Practice of Metal Cutting*, Chilton Publishing Co., Philadelphia, 1958; also in *Grundzuge der Zerspanungslehre*, second edition, Springer Verlag, Berlin-Heidelberg, 1954.

Fig. 1. Five-axis gantry type skin milling machine. Numerical controls can be applied to multiple-spindle machines to produce duplicate or mirror image parts.

programming a CONTOUR MILLING MACHINE

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Abstracted from Paper 108, "Contouring Control from Numerical Data," to be presented at the 26th Annual Meeting. Copies of the complete paper will be available for purchase from Society Headquarters.

Machine programming for tape or punched card control is a relatively new branch of tool engineering. The author shows—step-by-step—how a program is developed.

With the development of numerically controlled machine tools, machine programming has become an important responsibility of tool engineers. Programming is the process of defining the geometry of the workpiece by coordinate points and codes suitable for the control of the machine tool, *Fig.* 1. It also includes the coding of auxiliary information required for the complete automatic control of the machine, such as spindle rotation and speed, coolant, and feed rate. This information is coded on either punched cards or tape.

The generation of complex contours, *Fig.* 2, requires that the tool be controlled continuously at all points along its path. In a numerically controlled machine, this requires interpolation of many additional points between the points determined by in-

formation on punched cards or tape. In the Cincinnati numerical control system, interpolation between specified points is done in the interpolator units of the numerical control panel. In this digital-analog system, input data for each axis of motion is fed into memory units, converted to analog form, interpolated, and compared to a feed-back location signal. Circuits consisting of toroidal transformers, rotary switches and induction potentiometers make possible the generation of either a straight line or a parabola. Entire lines or parabolas are determined by two or three points taken from the punched cards.

Punched Card: A typical 10-column card is illustrated in *Fig.* 3. Individual blocks of information are labeled for identification. The first two blocks labeled "Part Number" and "Operation Number" are for identification purposes only, and are not required for the control of the machine tool. The next three blocks labeled "Start Sequence," "Left Spindle" and "Right Spindle" are self-explanatory and utilize on-off type codes. The block marked "Card Number" is used for sequencing the complete deck of cards. The "Forecast Number" block is used as a sequence check of cards being read in the card reader.

The "Type of Operation" block defines the combination of axes under numerical control. The next two blocks, "Cutter Wear Axis" and "Cutter Wear Direction," are required for control of the cutter diameter compensation unit. The block "Type of Interpolation" controls whether there will be parabolic, straight line, or cross injection type of interpolation between the coordinate data points. Parabolic interpolation is defined as the generation of a parabola through three coordinate points by the interpolator of the control unit. As the interpolator is rotated, it produced parametric equations of the independent variables (X, Y, Z, etc.) as a function of time. Straight line interpolation requires only two coordinate points. Cross injection is a special type of interpolation which will be covered later. Various junction routines are used to connect interpolated contour sections.

Considering the first two types of interpolation, the contour of any given part can be subdivided into either a parabola or a straight line section. These sections are defined as spans. Each successive span uses the end point of the previous span and two additional points for parabolic interpolation or one additional point for straight line interpolation. The maximum span length is approximately 35 inches. For parabolic interpolation, the two additional points must be chosen such that one of them represents the midpoint of the span and the other the end of the span, which is also the beginning of the next span. The range covered by the parabolic span must approximate the desired function within allowable tolerance limits.

Fig. 2. Many parts have complex contours which require continuous control throughout cutter path.

The "Interpolator Speed" block is used to control the feed rate of the machine tool. The last six blocks of information contain the coordinate points (Xv, Yv, Zv, Xy, Yy, Zy in inches) for the interpolation span, the first three being the coordinates of the midpoint and used only for parabolic interpolation, the last three being the coordinates of the end point and used for all interpolations. The X and Y coordinates are defined as six digit numbers with three places to the left and three places to the right of the decimal point. The Z coordinate contains only five digits, three to the right and two to the left of the decimal point.

Programming by Computer: It is possible to develop a machine program in two ways: either by using a computer or by using a desk calculator, *Fig.* 4. Programming with a computer is accomplished in three steps. These steps are illustrated by programming the cutter path for a sample part, *Fig.* 5. The first step is to completely finish contouring the outside dimensions of the D shape of the sample part. The second step is to remove the additional metal about the outside of the part, including corners M and N, and the final step is to contour the inside and remove the excess metal from the pocket. For programming the sample part by the digital computer method, an arbitrary starting point S was selected. A junction routine was first programmed,

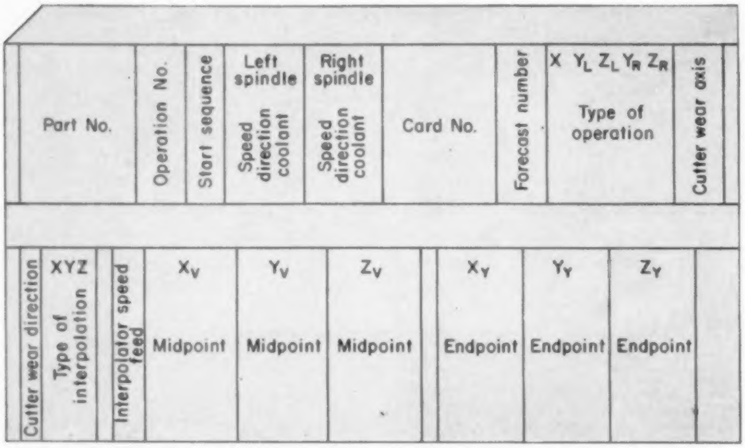

Fig. 3. Punched cards contain information to be fed to machine control. One card is required for each interpolation.

which brought the cutter from the starting point *S* to *B* opposite point 1. A straight line routine was employed between points 1 and 4. With the cutter opposite point 4, a circle routine was employed requiring the input data of points 3 and 9. Point 9 is the center of the desired circle. The computer then determined the number of spans or parabolic interpolations necessary to contour this circle. As computed, this curve required approximately 14 parabolic interpolation spans. A straight line routine was then programmed between points 3 and 2 with the code for the corner junction routine included with the computer input data. Another straight line routine was employed between points 2 and 1. With the use of a larger radius for the cutter and the same data for points 2 and 1 in the subsequent curve, this

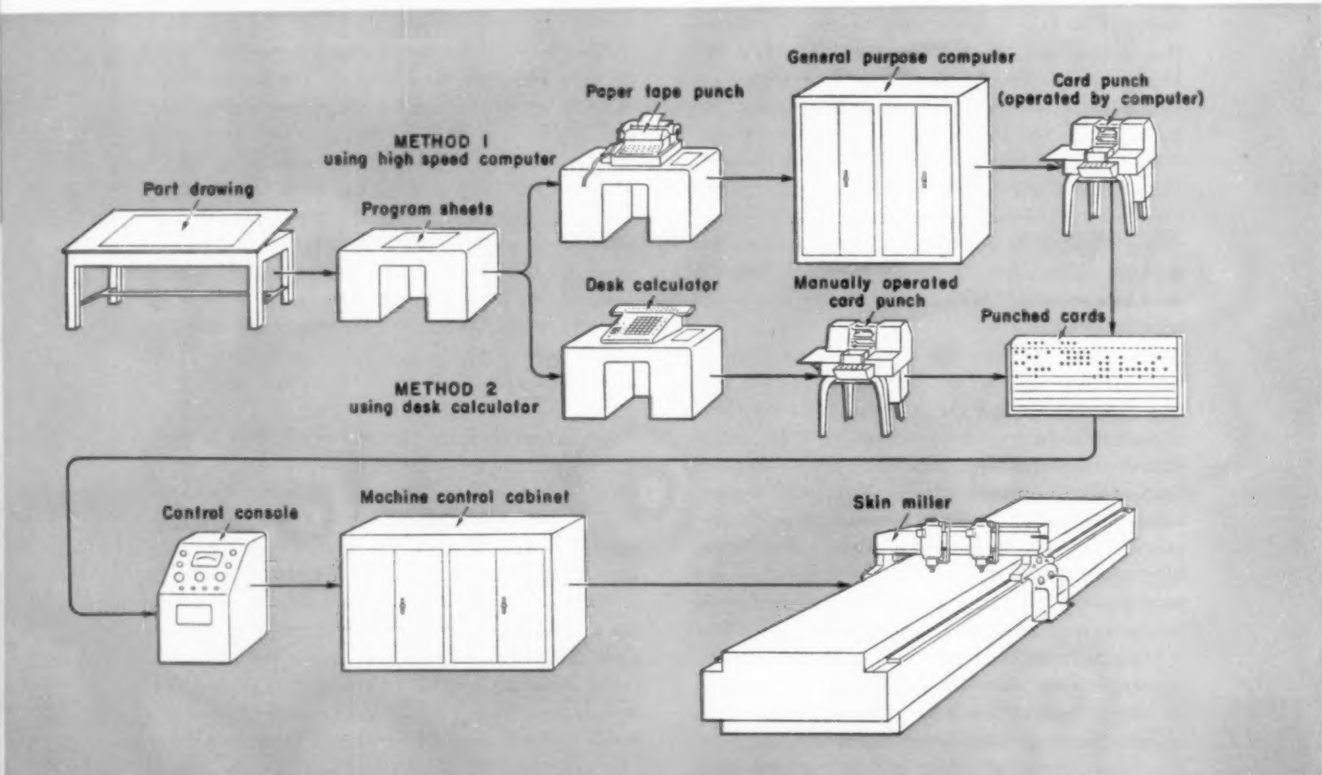

Fig. 4. Desk calculators and digital computers provide two methods of programming for numerical control.

junction routine automatically moved the cutter into position for the next pass about the contour without the introduction of new data points. This contouring about the part was continued for several additional passes, cleaning away additional material, by using the same basic data over again with an increase in cutter radius at each pass.

The removal of excess metal at the two corners of the part required a slightly different type of operation than contouring. A rough approximation of the stock left on the corners was made graphically, and reference points were arbitrarily chosen. The remainder of the stock was removed with combinations of straight line and junction routines. The number of passes required can be determined either graphically or mathematically if the area to be cleared is relatively simple.

The pocketing of the inside of the part was accomplished in precisely the same way as for the two corners; however, this time the pocketed area was defined by a circle and straight line rather than three straight lines. A straight line contouring routine was used between points 18 and 3 in the *X*, *Y*, and *Z* planes. This cleared the cutter above the work. A junction routine was then employed which brought the cutter opposite point 6. A straight line routine was programmed between points 6 and 19, again in the *X*, *Y*, and *Z* planes. This allowed the cutter to move down into the work as it progressed between the points and thus prevented marking of the surface as would occur with a straight plunge or axial cut. As *Z* dimension approached full depth at point 19, a deceleration span was included in the program. A straight line contouring routine was then programmed between points 19 and 5, with *Z* constant and at the proper depth. The depth was held constant throughout the remainder of the pocketing operation. A deceleration span code was included with input data since the cutter moved into a corner.

A circle contouring routine was then programmed between points 8 and 7. A straight line contouring routine was programmed between points 6 and 5 with the cutter at full depth. The circle contouring routine was repeated. With the completion of the inside pocketing, the cutter was raised above the work and the spindle was returned to the parked position. Pocketing operations may also be accomplished with routines of circles, ellipses, triangles and quadrilaterals.

There were 49 input cards to the computer, with the resulting number of output cards from the computer to control the machine tool numbering 102. The computing time was approximately 9 minutes, while the programming time was 1 hour, 12 minutes.

Desk Calculator Method: Because of its simple shape, this part could be easily programmed using the desk calculator method, *Fig.* 6. An accurate scale drawing of the part to be machined is a necessity, and the plotting of the safe cutter center path is also required in most cases. In developing the program by the calculator method, the majority of the points used were carefully located with the aid of an accurate drawing. The programming was considered in the three steps, the same as with the computer-programmed method.

This time the starting point was carefully determined, since it is an initial point of a span, to a point *B* opposite 4, on the finished contour of the part. The end point of that span was also carefully determined, and its coordinates, along with the necessary auxiliary codes, constitute the required data

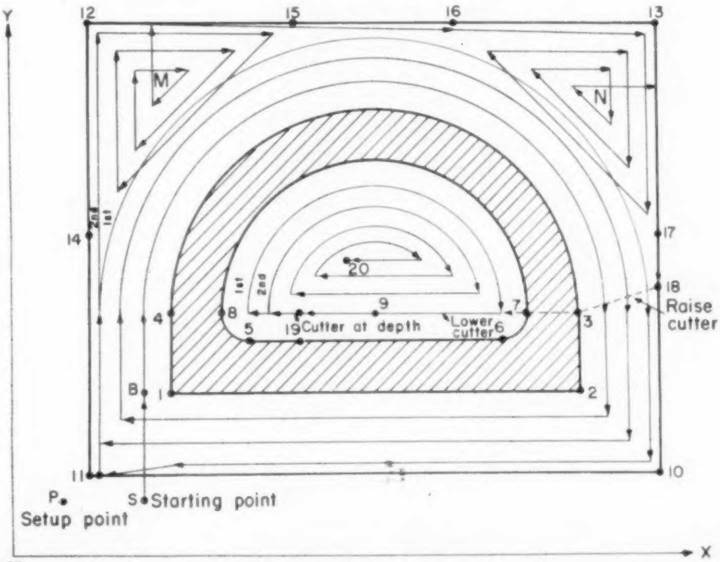

Fig. 5. Sample part with cutter path programmed by digital computer method.

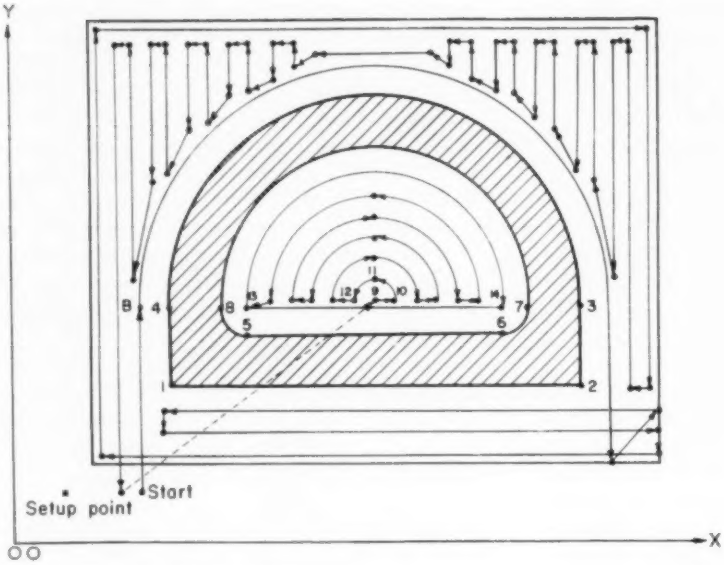

Fig. 6. Sample part with cutter path programmed by desk calculator method.

input. The programmer has then to consider the circle section of the part and must compute the necessary parabolic interpolation spans required to accurately reproduce the circle. The maximum included arc of a circle for any span can be determined since it is a function of the allowable error and the combined radii of the cutter and the circle. Thus, knowing the maximum included arc of the circle, the programmer can easily compute the necessary points for each parabolic span with a desk calculator. The time required to compute the spans on the outside and inside contouring circles was approximately 40 minutes with the use of a desk calculator.

Once the circle had been computed, the programmer determined the end point for a straight line interpolation so as to cut the contour between points 3 and 2. The programmer next determined by hand computations the points necessary to align the cutter for a straight line cut parallel to points 2 and 1. With this cut, the part had been completely contoured, using approximately 14 input data cards to the control unit. The remainder of the metal on the outside of the part was removed by a careful choice of cutter paths. Minimum cutting time was considered here rather than minimum programming time.

The pocketing of the inside of the part was accomplished by cross injection interpolation. Cross injection interpolation is a special type of interpolation built into the control unit. It automatically sets up a parabolic path between two points which are 90 deg apart on the arc of a circle. It was designed specifically for the rounding of 90 deg corners. The only input data for this interpolation are the coordinates for the two points which are 90 deg apart.

The method of programming the pocketing of the part was different from the computer method. The cutter was moved to a point over the center of the pocket, point 9, and lowered to depth. A point 10 to the right of point 9 was determined and the cutter moved to it by means of straight line interpolation. The next point 11 was then determined at 90 deg from the last, and cross injection interpolation was used. This moved the cutter on a parabolic path between points 10 and 11. Point 12 was determined at 90 deg from point 11 and cross injection was used moving the cutter again on a parabolic path between points.

The operation was continued as shown until almost all the excess metal in the area had been removed. For the final contouring cut on the inside of the *D*, however, all parabolic interpolation spans were accurately computed for the semicircle 13 to 14 and the straight line interpolation 14 to 13 so as to be within the allowable error. Only 96 input cards were required for the control unit, and programming required 2 hours and 10 minutes.

Even if a part is correctly programmed, machining accuracy will suffer unless the control system itself is capable of high accuracy. The Cincinnati measuring system is based on units that have a theoretical accuracy of one part in 500,000. Considering loading and other influencing factors, a resolution of one part in 100,000 can be obtained. This provides a static measuring accuracy within 0.001 inch, based on a 100-inch range, or 0.0001 inch, based on a 10-inch range. With this close resolution, all normal accuracy requirements are met.

Programming is an essential element of numerical control. The proper selection of programming methods and routines offers savings in programming time and machining time.

METAL-FIBER PLASTICS ...extend die life

By A. P. Mazzucchelli
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Steel, glass and aluminum fibers, used with heat-resistant epoxy resins, cut die costs and construction time—both important considerations in these highly competitive times, when model changes are frequent and production runs correspondingly short.

METAL-FIBER REINFORCEMENTS with heat-resistant epoxy resin make plastics tools and dies with superior properties. Abrasion resistance, impact strength, heat-distortion point, and thermal conductivity are much greater than those of conventionally filled, room-temperature epoxy compositions. The improvement is such that these metal-fiber-reinforced compositions can be used for the more difficult prototype jobs and many medium-run production jobs. In addition, metal-fibers bring to such structures a high degree of machinability and a control over exothermal heating which permits epoxy castings of practically unlimited size with low shrinkage.

Basically, investigation has centered around three types of reinforced, heat-resistant epoxy compositions, utilizing three types of metal-fiber reinforcement; namely, steel, aluminum, and combinations of steel and glass fibers. These fibers are incorporated into the resin and cast by a pressure process. To obtain best performance when applying these compositions to tools and dies, *Fig.* 1, a special technique was developed for flocking or spraying a face coat of short-fibers on the pattern or mold used for fabricating the reinforced casting. Either glass or metal fibers may be used for the body of the casting, but for best results, it has been found necessary that this face coat of chopped metal-fiber flocking be applied to the surface of the casting. In addition to being essential for satisfactory die performance, the metal fibers flocked on the surface prevent the resin face coat from sagging on corners and vertical walls of die molds.

Specifically, the three types of composition which

Abstracted from Paper 55, "For Tools and Dies—New Epoxy-Fiber Compositions," to be presented at the 26th Annual Meeting. Copies of the complete paper will be available for purchase from Society Headquarters.

this work indicated to be the most suitable for metal-forming dies and other tooling are these: (1) a mass casting of a heat-resistant epoxy resin system reinforced with low-carbon steel fibers of continuous or varying length and surfaced with a face coat based on an epoxy resin and steel-fiber flocking; (2) a mass casting of a heat-resistant epoxy resin system reinforced with glass fiber and surfaced with a face coat based on an epoxy resin and steel-fiber flocking, the face coat sometimes backed with a steel fiber mat; (3) a mass casting of a heat-resistant epoxy resin system reinforced with aluminum fibers and surfaced with a face coat based on an epoxy resin and aluminum-fiber flocking. In commercial use, these compositions have been designated epoxy-alloy ES, EG-SF and EA, respectively. The letters indicate epoxy steel, epoxy glass-steel face and epoxy aluminum.

Process, Properties: As shown in TABLE 1, these metal-fiber-reinforced compositions are superior to unfilled epoxy systems. This type of composition creates a homogenous tool or die, so that the danger of bond-line rupture, which frequently occurs between the metal core and resin face coat of a conventional die, is eliminated.

Homogeneity and metal-fiber reinforcement can also result in a casting with excellent machinability characteristics and the unusual characteristic of being magnetic when steel fiber is used. The outstanding toughness which this type of reinforced epoxy displays permits easy retention and support of dowels, screws and steel cutting edges. In addition to imparting necessary abrasion resistance to the surface of a metal-forming die, the metal fibers flocked on the surface facilitate retention of the face coat on the corners and vertical walls of the die mold during fabrication.

A wide number of variations, which may have an accompanying effect on properties, are possible in fabricating these materials into tools and dies. Broadly, the fabricating procedure consists of pressure casting a heat resistant epoxy resin system with metal fibers, or with glass fibers and metal-fiber reinforcement.

A heat-resistant epoxy was chosen for these compositions because of its advantages over standard epoxy systems. When reinforced with metal or glass fibers, it greatly reduces galling and creep problems resulting from the low heat-distortion point of room-temperature curing epoxy systems. In addition to providing the basis for a tool and die material with improved high-temperature performance, such a resin system has the advantage of a longer "pot life" than a room-temperature epoxy.

Metal or glass fibers for reinforcing reduces the problems of shrinkage and brittleness experienced with most heat-resistant systems and extends their operating temperature to 350 F. One of the most important characteristics of these compositions is their mass castability without sacrifice of toughness and other physical properties. These plastics give off heat during curing.

In comparing the exothermic heating of two 5 x 10 x 20-inch, heat-resistant epoxy castings, one with

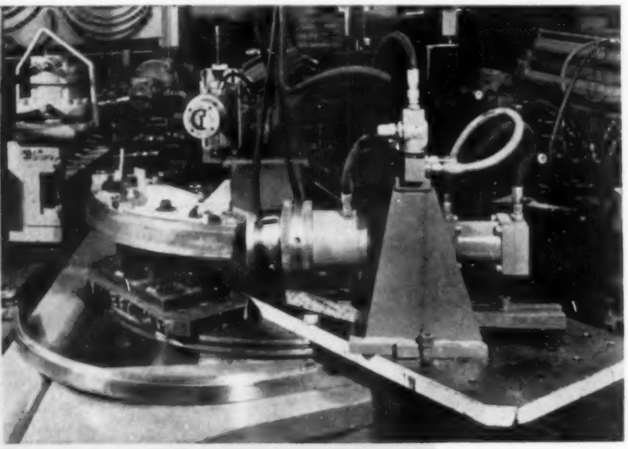


Fig. 1. (above) Radial forming die for stainless-steel stringer Z-section. Die consists of an ES shell, pressure cast on aluminum core.

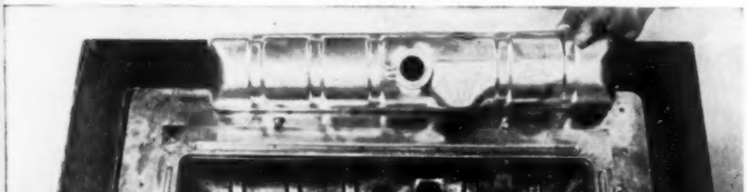


Fig. 2. (right) ES punch and die used to produce over 130,000 radiator tank-top stampings.

55 percent iron powder and one with 55 percent steel fibers, the iron-powder casting reached 387 F, while the steel-fiber casting reached a temperature of 214 F. Gel time doubled for the steel-fiber casting, i.e., from 3 to 6 hours. Similarly in a 9 x 20 x 10-inch casting made in an insulated mold and containing 60 percent steel fibers, peak temperature was 311 F. The excellent thermal conductivity and continuous nature of the steel fiber helped to distribute the heat throughout the casting, as well as acting as a heat sink. About the same temperature control was obtained with glass fibers because of their higher specific heat; while aluminum fibers have provided the best control because of their combination of high specific heat, thermal conductivity, and ability to dissipate heat from the center of the casting.

In the fabrication of tools and dies, the question of whether EG-SF, ES, or EA should be used may arise. Each composition has its own advantages and provides a choice to meet the needs of specific applications. Composition EG-SF, for example, offers some fabricating advantages over ES and EA, particularly for complex automotive dies. Casting pressure required for EG-SF is 50 to 100 psi, as compared with 200 to 300 psi for compositions ES and EA. Mold-box build-up height is ½ the depth of the cast for glass fibers, as compared with a build-up height of three to four times the depth for metal fibers.

These factors generally reduce cost of build-up and press size, and minimize pattern and plaster-mold problems. Since a resin-glass fiber premix has mobility under pressure, it uniformly fills out greatly contoured dies. In contrast, available metal fibers show little or no lateral movement during casting, and greater care must be taken in loading in order to obtain uniform fiber distribution. Finally, the mechanical properties of EG-SF are superior to those of the ES and EA. Some of these adverse characteristics of the ES and EA materials and process may be altered favorably by the use of densified metal-fiber mats and preforms. As previously indicated, such mats and preforms will facilitate loading and reduce the mold build-up and casting pressure normally required for compositions ES and EA.

On the other hand, compositions ES and EA have some advantages as compared with EG-SF. Greater care must be taken with EG-SF to apply the steel-flocked face coat uniformly and to avoid bridging of the glass fibers in sharp contours. The resin system and glass fibers for the mass must be premixed in a separate operation; whereas, with ES and EA, the mass is directly pressure cast. ES and EA have better machinability than EG-SF and provide materials which are homogeneous, an important characteristic when making die changes or repairs. Thermal conductivity of ES and EA are much better than EG-SF; EG will not heat by induction or resistance as will ES and EA. While the mechanical properties of ES and EA are below those of EG- SF, commercial performance has indicated that the ES and EA compositions are entirely adequate for their particular tooling applications.

Case Histories: In addition to information obtained from metal-fiber-reinforced compositions in test dies, data are available from more than sixty commercial dies constructed from these materials. These dies were built co-operatively by Modern Pattern and Plastics, Inc., of Toledo, Ohio and Warren Plastics and Eng. Co. of Roseville, Mich.

Radiator-Tank Top: One of the first commercial ES dies built, a punch for automotive-radiator-tank tops, about 23 x 4 x 7 inches deep, was run with a conventional iron alloy draw ring and pad and used to form 0.025-inches brass. A total of 11,000 stampings was fabricated by Long Mfg. Div. of Borg-Warner Corp. As a result of this promising performance, a complete ES radiator draw die was

Table 1—Properties of Fiber-Reinforced Epoxy Compositions*

Property	Unfilled	Composition ES	Composition EG-SF	Composition EA
Type of fiber	—	Steel	Glass†	Aluminum
Specific gravity	1.15	2.25	1.55	1.8
Flexural properties				
Ultimate strength, psi	17,500	11,000-16,000	16,000-29,000	8,500-13,500
Tang. prop. limit, psi	11,000	6,500-8,300	12,000-25,000	5,300-7,500
Modulus of elasticity, 10^{-6} psi	0.5	0.8-1.6	1.4-1.8	0.9-1.9
Compressive properties				
Ultimate strength, psi	33,500	12,500-28,500	21,000-29,000	12,000-21,000
Tang. prop. limit, psi	11,000	6,500-18,500	14,000-20,000	7,500-12,000
Modulus of elasticity, 10^{-6} psi	0.4	0.4-0.8	1.2-1.8	0.6-0.9
Heat distortion point,§ F	275	400	400	400
Rockwell hardness, M	114	72-82	103-111	56-81
Izod impact, ft-lb	0.4	0.8-1.6	11	0.7-1.6
Thermal expansion coef., 10^{-6} F	88	43	—	55
Thermal conductivity, (Btu/hr/ft²/F/in.)	2.0	19-30	5	51-131
Maximum operating temperature, F	—	350	350	350

*Properties measured perpendicular to casting pressure.

†With steel-fiber face coat.

§Temperature at which a standard bar will deflect 0.010 inch

built, *Fig.* 2. The complete ES punch and die was built with a steel trimline flange and a metal ring insert on top to form the filler neck. The die was cast in a steel box which formed the steel draw radius and surface. A metal draw ring was used. Thus the ES casting was limited to the more costly contoured areas, while the critical wear surfaces were metal.

STRINGER Z SECTION: Built for Cyril Bath Co. a radial-forming die of ES material, *Fig.* 1, formed 80 parts of a stringer Z-section of 0.032-inch, type 17-7 PH stainless steel. In this forming operation the brake-formed cross section, 2½ x 40 inches, is stretched beyond its yield point and the die rotated into the straight part with a force-at-point contact of about 300 pounds.

In the fabrication of this ES die, a shell of steel-fiber reinforced, heat-resistant epoxy was pressure cast against an aluminum core, using a steel-fiber mat carefully laid over the core. The cured casting was fastened securely to the aluminum core with screws. This die, illustrating a surface-pressure-casting technique, is still in operation and is performing satisfactorily, although volume requirements for the part are low. It is believed that these compositions will be particularly advantageous for such stretch dies when sharp corners must be formed.

REFRIGERATOR BOTTOM PANEL: A refrigerator bottom panel draw die, *Fig.* 4, for the refrigeration department of Hotpoint Co. involves four ES punch and pad inserts for first draw and redraw dies, each with flat metal rings, to form a 0.036-inch cold-rolled-steel panel. No particular difficulty was encountered in casting these inserts at 300 psi using a reinforced plaster mold.

These dies have made 65,000 acceptable panels and are still in operation. There have been no repairs required, and the contoured ES punch inserts have remained relatively unchanged. During the production run, the greatest change occurred due to wear in a sharp radius of the plastic insert of the redraw die, wich was really an extension of the metal radius. This radius started at 0.08 inch, increased to 0.19 inch after 5000 panels, and to 0.44 inch after 15,000 panels, remaining unchanged thereafter, which still met the requirements for this panel.

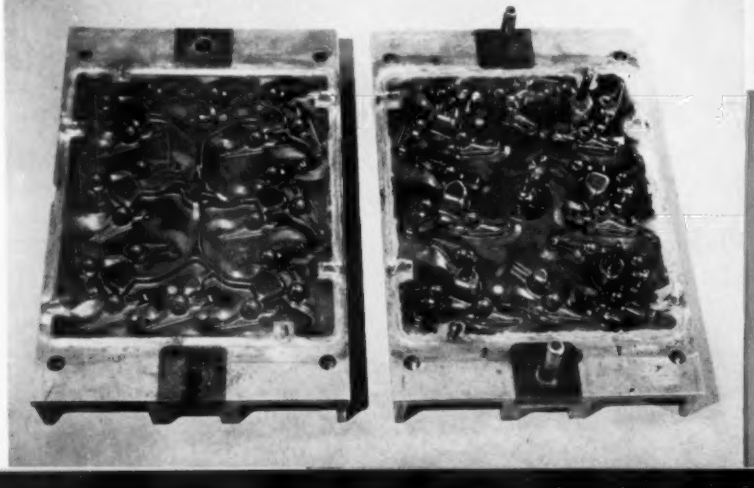
Delivery of these dies was made in five weeks, whereas the equivalent all-metal dies would have required 10 weeks. At the same time, cost was $275 less for each of the dies.

These results indicate the applicability of metal-fiber reinforced epoxy materials for contoured punch and pad inserts for low and medium-production, metal forming dies, in areas which will not wear seriously, using metal for the rings. Tentative results indicate that a ½-inch draw radius with 0.036 inch cold-rolled steel will not wear. There are many inside panels where such generous radii would be accepted functionally as part of the original design.

MATCHED MOLD AND FOUNDRY PATTERN: Besides ES and EG-SF metal-forming dies, a large EA

Fig. 4. (above) Redraw die with ES punch and pad insert for stamping refrigerator-bottom panels.

Fig. 3. (below) Green-sand foundry pattern which resolved an operating-temperature problem.



matched mold and an EA green-sand foundry pattern have been placed in production.

An EA green-sand foundry pattern, *Fig.* 3, for rocker-arm castings was fabricated for operation with recirculating hot sand. Although standard epoxies have proved satisfactory for cold-sand foundry patterns, the re-circulating hot sand had in the past resulted in a high rejection rate of castings due to sand drag. To avoid condensation on the pattern and sand-drag difficulties, it was desired to operate the pattern above the sand temperature. This EA pattern, because of its superior thermal conductivity, resolved the operating-temperature problem.

Advantages of Dies: The over-all cost of these fiber-reinforced epoxy compositions will vary, depending on the volume and specific combination used, but it will generally be in the range of present epoxy tooling materials. At the present time, dies made from these compositions and using the pressure casting technique will cost more than a simple casting of compounded epoxy. For this reason, these materials are only intended for use where their particular properties are needed and their known advantages extend application to areas where conventional plastic tooling materials are marginal or unsatisfactory. Nevertheless, as shown in TABLE 2, there are still considerable savings over the cost of equivalent metal dies.

Furthermore, because of savings in machining and spotting, such comparisons often do not entirely reflect the cost and time advantages which normally accrue through the use of plastic dies instead of metal dies. These savings are well known and are also generally applicable to these metal-fiber-reinforced epoxy tooling compounds. For example, in the refrigerator-panel case history described above, the actual dollar saving with the plastic dies was not much greater than if all-metal dies were used. However, production was able to begin five weeks earlier.

To date, the performance records of commercial dies fabricated from these compositions confirm the results obtained with test dies. To summarize, they both indicate the following preliminary practical utility range for ES and EG-SF compositions.

1. *Prototype or Development Draw Dies:* For deep draws of heavy metals, and large compound-contour stampings of up to ¼-inch thick stainless steel.
2. *Low-Production Draw Dies:* For runs of 1000 to 10,000 stampings, without metal rings or inserts. Gage of metal and design of stamping will have to be considered.
3. *Medium-Production Draw Dies:* For runs of 10,000 to 50,000 stampings, in which contoured punches and pads are used with metal inserts, draw rings, and blank holders.
4. *Medium-High-Production Draw Dies:* For runs of 50,000 to 150,000 or more stampings of the thinner and more easily formed metals, such as 0.025-inch brass.
5. *Flanging, Trimming, Restrike, and Secondary Operation Dies:* Highly desirable because of superior machinability and toughness, plus ability to retain and support dowels, screws and steel cutting edges.
6. *Hydroform and Rubber-Pad Forming Dies:* Mass castability, abrasion resistance, and lack of scratching of soft aluminum and stainless steel provide advantages over current materials.
7. *Stretch Dies:* For more difficult sharper radii, and for hot stretch forming dies where present materials are marginal.
8. *Fixtures and Gages:* For special applications requiring mass casts for needed rigidity, or where heat resistance and abrasion resistance make it more suitable than materials in current large-scale use.

Conclusions: Advantages of these metal-fiber-reinforced epoxy compositions are already significant. Besides retaining the benefits of current plastics die materials; namely, low cost, light weight, and shorter tooling time, they have the following additional advantages:

1. Outstanding performance in metal forming dies.
2. Ability to be mass cast in large volumes to complicated shapes with low shrinkage and controlled exotherm, while obtaining higher impact strength, heat distortion, rigidity, and resistance to thermal shock.
3. Up to 60 times better thermal conductivity-equivalent to some grades of stainless steel, 35 percent that of regular steel, and 8 percent that of aluminum.
4. Can be made easily machinable, magnetic and suitable for induction and low-voltage resistance heating.

A limiting factor to these advantages are higher process and equipment costs as compared with present plastic materials. Improved metal fibers and the development of mechanized fabrication techniques will simplify fabrication, lower costs and extend large-scale use. For the present, however, the use of these compositions will be confined to applications where present materials are inadequate. Other improvements to be desired include further increased die-surface hardness, wear, erosion resistance, and heat resistance. Research continues in all of these areas, with definite progress being made.

Table 2—Comparative Costs for Fiber-Reinforced Epoxy Dies and Metal Dies

Name of Die	Metal ($)	Reinforced Epoxy ($)	
Test terminal box (steel)	2,500-4,000	982	(ES)
(Zinc base alloy)	1,218-1,330		
Refrigerator bottom panel			
1st draw	4,100	3,825	(ES)
2nd draw	3,015	2,740	(ES)
Radiator tank top	3,000-5,500	2,225	(ES)
Charcoal broiler tray	3,175-5,350	2,380	(EG-SF)
Vending machine panel	9,000-12,000	5,950	(EA)
Foundry pattern	3,000	1,000	(EA)

CERAMIC TOOLING
for high-temperature plastics

By J. D. Stillman
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Manufacturing Development
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Hard-faced ceramics provide an economical material to produce forming tools for high-temperature plastics. A tested procedure is outlined for making low-cost tooling.

INCREASING NEEDS for high-temperature plastics components for aircraft poses the problem of economically producing forming tools. Requirements for high-quality tools at a cost commensurate with the relatively short production runs common to the aircraft industry intensify the problem.

Wide variations in temperatures and pressures found in forming and curing high-temperature plastics eliminate the use of many of the tooling materials presently used with low-pressure laminates. In addition to high-temperature resistance, tools for plastic production must be nonporous with a smooth surface finish that is nonreactive to the ingredients of the resins, hardeners or catalysts. From the standpoint of labor and materials, tools should have surfaces which are easy to prepare with release agents, economical to produce, reproduced easily to meet production demands and dimensionally stable.

Plaster and most plastics tools are not serviceable at high temperature. Cements and similar products are useful in certain places but are somewhat limited due to porosity and dimensional change under heat. Plastics tools suffer from repeated use at high temperatures and pressures by softening and distorting. Softening of plastics at elevated temperatures creates problems in the release of the part from the mold or die. Excellent tools are machined from metal but for short production runs, especially where complex configurations are involved, costs are often prohibitive. To find an economical solution to the problem of making tools for the fabrication of high-temperature plastics, ceramic materials were studied.

Various production methods employed by the ceramic industry were found unsatisfactory with the exception of slip casting. This technique lent itself best to the production of tools. Large or small shapes, simple or complex, with the minimum expenditure of labor, and the greatest potential benefits in both productibility and economy were possible.

The choice of materials was more difficult due to the unlimited combinations of substances that the potter has available for his use. Tests of earthenware bodies were abandoned due to their instability at points approaching vitrification. Investigations of several types of stoneware and porcelain bodies were made with the result that a porcelanic body containing a relatively high percentage of Nepheline Syenite was chosen as being the most practical. This body, maturing at Cone 4 (1190 C when fired at a rate of 150 C rise per hour), was chosen because of its relatively low firing temperature. In addition, it could be cast and fired in thick sections without cracking or warping.

During the investigation of clay bodies, a material designed for use in investment casting proved interesting. Its advantages include high resistance to thermal shock, which permits short firing cycles, and its comparatively low firing temperature (1920 F). Two problems were encountered in the use of this material. The first, porosity of the fired ware, can be remedied by the application of a glaze. The

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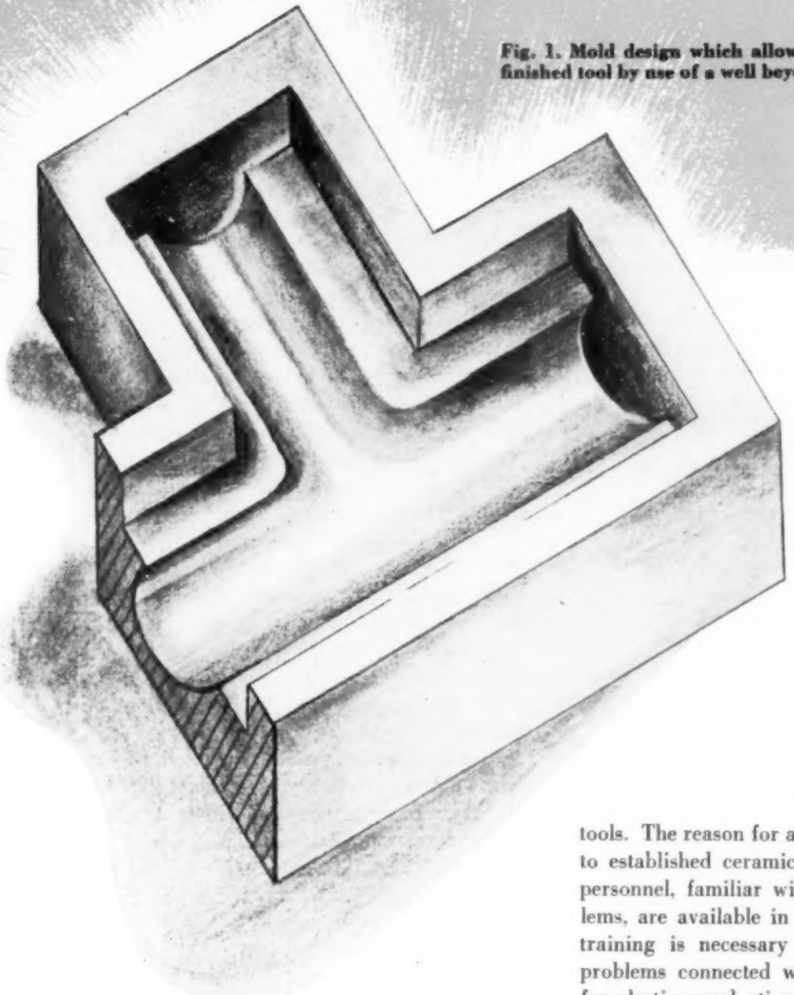
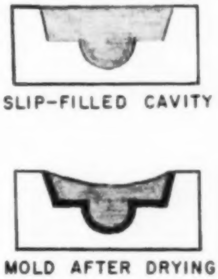
Abstracted from Paper 74, "Vitrifiable Silicate Tooling for High-Temperature Plastics," to be presented at the 26th ASTE Annual Meeting. Copies of the complete paper will be available for purchase from Society Headquarters.

Fig. 1. Mold design which allows for shrinkage of the finished tool by use of a well beyond the end of the part.





second, lack of shrinkage, coupled with the low-strength characteristics in its unfired state, limited its use because large draft allowances had to be made in order to release the cast from the mold. Efforts to overcome these deficiencies by adding ball clay to the material did not lead to any significant results. The addition of enough clay to obtain the needed "green" strength and vitrification increased its tendency to warp and reduced its resistance to thermal shock.

A later series of tests using combinations of the Nepheline Syenite clay and the investment material were made. These tests show that a mixture of equal parts of the two materials results in a strong glassy product which, when fired, has good thermal shock resistance without noticeable distortion or warpage. Tools made from this combination of materials are vitreous and require only a light application of silicone grease as a parting agent.

Standard pottery techniques and procedures offered the greatest possibilities for making ceramic tools. The reason for adhering as closely as possible to established ceramic techniques is that qualified personnel, familiar with ceramic production problems, are available in most industrial areas. Little training is necessary to acquaint them with the problems connected with producing ceramic tools for plastics production.

With this introduction, materials, their preparation, tooling requirements, operational procedures, and firing techniques may be considered in detail. It is understood that the compositions for materials used are but examples. Many others might be equally satisfactory. The clay body decided upon has the following composition:

Nepheline Syenite, % 38	Feldspar, % 9
Kentucky #4 Ball Clay, % 20	Silica, % 7
Edgar Georgia Kaolin, % 17	Sodium Silicate, % of solids 0.25
Tennessee #1 Ball Clay, % 9	Water, % of solids ..28

As the hardness of water has a marked effect on the fluidity of clay slips, it is impossible to give an exact figure for the quantity of water needed to produce a slip with good pouring and casting properties. However, it should weigh between 27 and 30 ounces per pint because the heavier slips are preferred. In hard-water areas, the addition of two to five percent barium carbonate will aid in improving fluidity of slips and reduce scumming.

The mixture of clays and water, to which the

sodium silicate and barium carbonate have been added, is "blunged" with a propeller type mixer or rolled in a ball mill until the slip has become a smooth uniform blend. Slow stirring is preferred to avoid mixing air into the slip.

The investment material referred to is mixed with a quantity of water equal to approximately 25 percent of the weight of dry material. The alkalinity of the water has some effect on the fluidity of the mixture, but is not as pronounced as with the clay slips. Additional water may be added if necessary but not in excess of 30 percent of the solid weights. The investment material and water are rolled in a jar mill with the addition of a few porcelain balls to disperse the lumps (six two-inch balls to a three-gallon jar is sufficient) until it has become fluid. This mixture is added in equal proportions by weight to the clay slip and then thoroughly mixed.

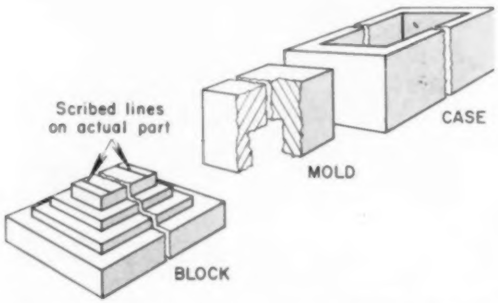


Fig. 2. Equipment used to make calibrated blocks for shrink tests of tooling ceramics.

Conventional pottery molds are used for casting. It is important that every section of a piece mold be of equal density, or warpage will result in drying and firing the cast. Careful weighing of the water and plaster before mixing will give assurance of uniformity. A high plaster-to-water ratio will result in a hard mold which has good wearing qualities but will cast slowly.

One and one quarter pounds of plaster to each pint of water is considered to be about average. Mixing with a propeller type mixer three to five minutes gives uniform slurries without entrapped air.

The mold design should include a well or sink beyond the end of part of a size ample to hold the slip absorbed by the mold during casting. This well, *Fig.* 1, makes refilling of the mold unnecessary.

Casting is accomplished by filling the thoroughly dried mold to the top with the mixture of clay slip and investment material. The mixture is allowed to stand until a deposit of clay is formed against the wall of the mold to the required finished thickness. This operation will require from 10 minutes to an hour, depending upon the desired cast thickness, slip density, mold condition and surrounding atmosphere humidity. Once the required thickness has been obtained, the excess slip is poured or drained out of the cavity. Then, the cast is allowed to stand until hard enough for handling. After hardening, it may be trimmed, removed from the mold and allowed to dry. Covering lightly, or drying under humid conditions, will help reduce warping or cracking.

When the cast is thoroughly dry, surface imperfections, e.g., mold seams may be scraped off with a knife or scraper and the area may be lightly smoothed with a damp sponge. Sanding is not recommended if the surface is to be glazed. When dry, the cast is ready for firing. Casts made of the investment material or equal parts of the investment material and clay slip may be preheated at 450 F for 30 minutes and placed directly in a kiln at 1920 F one half hour. After that time, they may be withdrawn and allowed to cool.

The parts made of the mixture of the two materials are nearly vitreous, and have a shrinkage of 12.4 percent. Shrinkages were determined by making a model test bar, *Fig.* 2, and exactly scribing two lines on the face 10 inches apart. To eliminate the possibility of error, this model is used to produce all the molds used in casting test bars for shrinkage calculations.

Where extremely fine surfaces are required on plastic parts, a glaze may be applied prior to firing. The glaze is mixed with water to a spraying consistency and applied to the dried cast to a thickness of 0.015 inch prior to preheating. As most of the glaze penetrates the surface of the cast during the firing, no correction need be made for build-up.

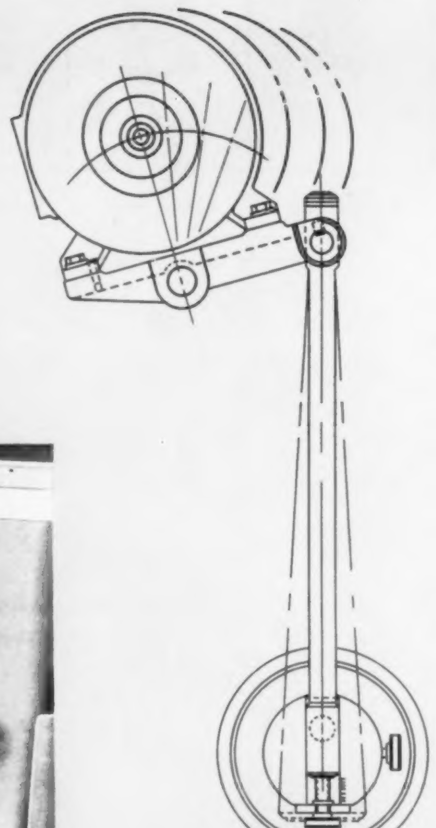
Efforts have been confined to the production of two types of plastics forming tools, viz, matched dies and form dies for the vacuum forming process. The applications for the latter are somewhat limited, due primarily to the difficulty of obtaining bagging materials capable of withstanding the curing temperatures. Breakaway molds are a possibility but, again, the use is limited by tension wrap and bagging materials being unable to perform their function at the required curing temperatures. Experimental work is underway in perfecting postcure techniques whereby an initial cure can be obtained at a low temperature after which the wrap and bag will be removed and the curing completed.

Tools for the production of high-temperature plastics parts made of ceramic materials can be produced at cost substantially below those of machined metals and yield equally good results. The fact that they may be economically reproduced in quantity to meet production schedules also adds to their desirability. Any variations in the materials, their ratios in the body, the firing time or end temperature make it almost impossible to accurately predict the end results. Success in the production of ceramic tools can be achieved only by careful control of materials, and fabrication techniques.

designed for
PRODUCTION

Oscillating Wheel Improves Grinder Output

Oscillating motion, superimposed on grinding wheel rotation produces a crosshatch pattern, making a high-degree finish in a short time. In addition, the necessity of moving the tool across the table is eliminated, resulting in less operator fatigue, more uniform and less wheel wear, and greater grinding accuracy. Wheel oscillations are produced by a 1/6-hp gearmotor on a 1-hp tool grinder designed by Wesson Co. Oscillations are produced by a crank eccentric at 144 rpm. Throw or wheel stroke is adjustable from 0 to 1½ inches.

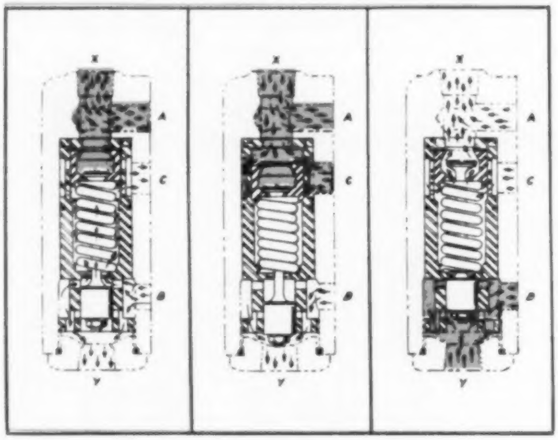


CRANK LINKAGE to provide adjustable-throw oscillations for grinding wheel.

CLOSE-UP of table (left) and wheel of oscillating grinder. Wheel guard may be rotated if other side of wheel is used.

DESIGNED FOR PRODUCTION

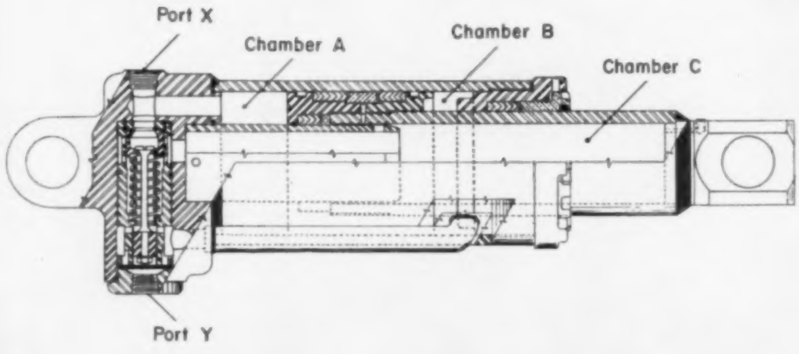
Dual Speed Hydraulic Cylinder Reduces Cycle Time



Rapid Feed | Power Feed | Return Cycle

DETAIL of control valve during cylinder operation.

Three-chambered cylinder with automatic valving reduces cycle time by providing rapid traverse return and infeed during the pre-engagement part of the infeed. The two high-speed chambers oppose each other and are located around the third or power cylinder. Designed by Crown Engineering Corp., the cylinder performs on the outer high-speed chamber during the fast traverses into and out of engagement. During forward motion, when the load increases to the point where the outer cylinder has insufficient power, the power cylinder becomes operative, providing maximum power at slow feed. Flow of oil to the cylinders is controlled by a spring-loaded poppet valve.



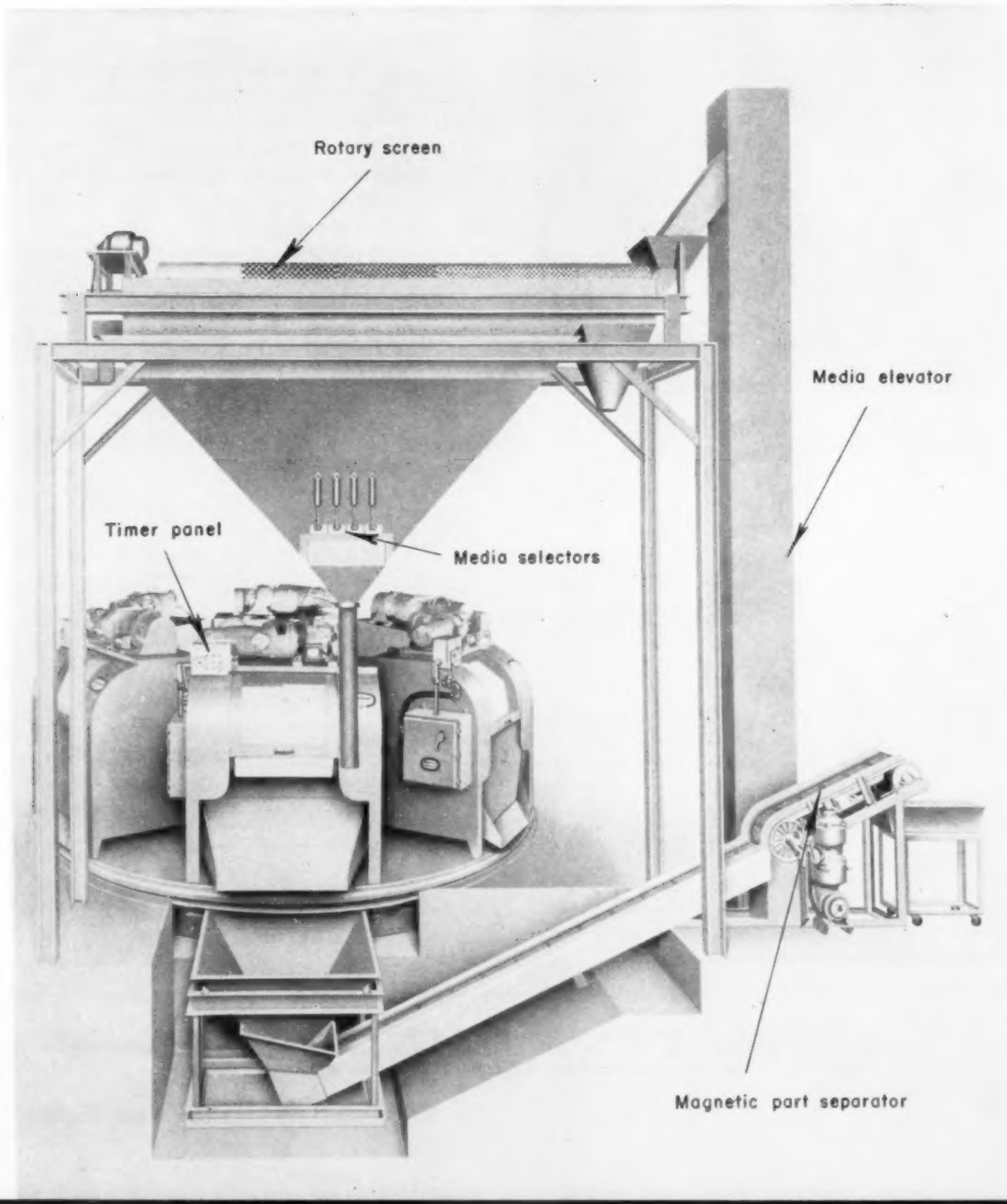
OPERATING CYCLE for hydraulic cylinder during rapid feed has oil flowing into chamber *A* through port *X*, out of chamber *B* and with a slight bypass into chamber *C*. As oil pressure increases, chamber *C* receives oil from port *X*. At disengagement, oil flow is through port *Y* into chamber *B* and out of chambers *C* and through port *X*.

Barrel Finishing System Saves Space

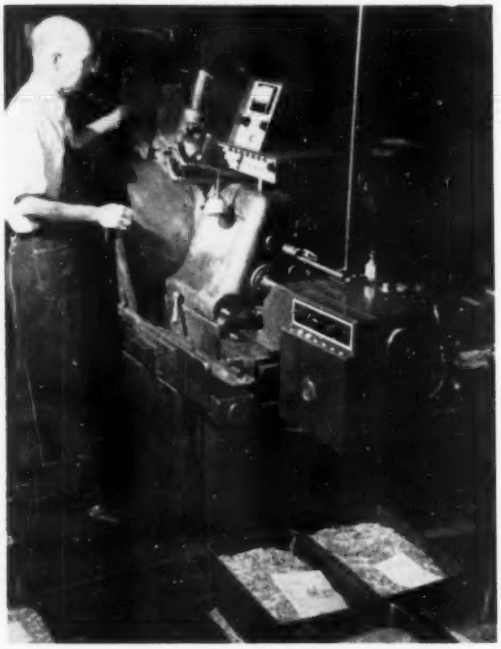
Mounted on a turntable in a compact circular arrangement, a six-station barrel finishing system conserves floor space and saves manpower. A common drain, a magnetic part selector, a media elevator and a rotary screen classifier serve the six barrels. In addition, timers on each barrel are set to a prescribed processing cycle at the conclusion of which, the machine is rotated to the worker's station to allow flushing. Since each barrel is individually timed in this system designed by Almco Division of Queen Products Inc., simultaneous deburring and finishing of a variety of parts may be performed in different barrels, having the timers set accordingly.

Design of the rotary screen media classifier permits separation, classification and storage of various sizes of media. During flushing, media is transported to the elevator which feeds the classifier for separating the various sizes.

SIX-STATION turntable barrel finishing machine having common service auxiliaries.



Electronics Control Grinder within Millionths

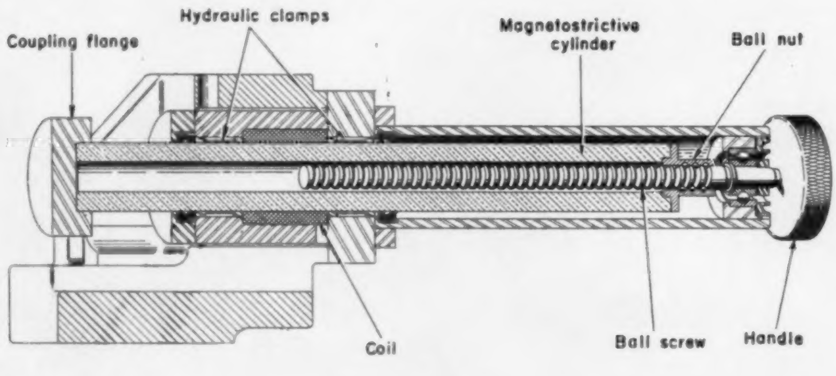


CENTERLESS GRINDER with electronic gage and precision linear actuator for adjusting grinder in accordance with signals from the feedback loop to the control system.

Precision gage and adjusting mechanism control centerless grinders at Torrington Co. to produce bearing needles within an accuracy that is consistently less than 50-millionths inch. Also, the system increases production by minimizing rejects.

Electronic gaging equipment checks each needle after grinding and determines the correction for wheel adjustment, if required. Statistical quality control is built into the gage circuit so that number of parts checked, small error or large error, cumulative trend, etc., determine the wheel-correction signal. For instance, if one part only gages slightly off size, no corrective signal is made.

The wheel adjustment mechanism utilizes an Inchworm linear motor developed by Airborne Instruments Laboratory Inc. This unusual actuator employs the action of magnetostriction which lengthens or shortens certain alloys when in an electrical field produced by a coil. Action of two clamps, working in sequence with the pulses in the coil determine the direction of linear movement, either forward or back, needed for adjustment.



INCHWORM MOTOR derives linear motion from magnetostriction action induced by pulses of electric field from a coil. Sequence of clamp opening and closing with respect to coil energizations determines direction of motor operation.

Fig. 1. Tool life is increased substantially on gear hobber by spraying coolant on the cutting tool-work interface.

SPRAYING OF COOLANTS increases tool life

By Alex Wilcox*
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Spraying of lubricants or coolants onto cutting tools has solved many production problems and has proved successful for many types of operations. Savings in cost have been effected on operations such as tapping, drilling, sawing, hobbing, punching, and grinding. Two typical applications are illustrated in *Figs.* 1 and 2.

This method of spraying has many advantages over the conventional methods of flooding. With the force of compressed air to carry it, the sprayed lubricant penetrates critical interfaces between the tool and workpiece. Spray can be delivered where the lubricant or coolant is needed such as at the cutting point. Spray can also be directed to the underside of a curled chip, a critical point impossible to reach by flooding. This feature has increased tool life in many plants.

Spray Applications: Spraying does an outstanding job simply because the finely divided, airborne spray exposes a considerably larger fluid surface area than do liquids applied in a stream. Thus, the spray is capable of absorbing heat at a faster rate from the tool, chip and workpiece. A large quantity of heat is quickly withdrawn through vaporization of the spray and by the cooling effect of the expanding compressed air when it reaches the atmosphere. To illustrate this advantage, the fusion of chips to the tool and the galling of workpieces were completely eliminated in metal sawing operations on a machine built by Oliver Machinery

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Co. and on machining operations at OK Rubber, Inc., through the application of spray lubrication.

Another desirable feature is that spraying uses only a small amount of lubricant. Some applications require only four ounces per hour at each lubrication point. In the gear hobbing machine illustrated in Fig. 1 the lubricant saving per year amounts to $250 per machine. Installed at the Cullman Wheel Co., this 36-inch gear hobber is cutting 1020 steel plate using Pennsylvania Petroleum ACRA mixed 40:1 with water.

Large coolant reservoirs are unnecessary. Pumps and filtering systems are eliminated because coolant is not recirculated or reclaimed. The finely divided spray tends to dry on the chips and workpieces. Finished work comes from the machine virtually free of chips and comparatively dry.

On a tapping machine at Square D Co., *Fig.* 2, production was increased 30 percent. Time formerly required to drain and wipe the tapped parts was saved. In addition, the tapping speed was increased 38 percent.

Spraying System: Three basic parts are involved in a spraying system. They include: an air-control unit consisting of an air filter and an air pressure regulator, a liquid reservoir, and control valves with spray nozzles.

As compressed air enters the system, the air control unit removes contaminating solids and liquids and controls the working pressure which the operator sets for the system. The liquid reservoir, which may vary from 1-quart to 5-gallon capacity, is pressurized by the regulated air pressure. Liquid and compressed air are conveyed separately to the control valve where the flow of each is controlled individually. The air and liquid are each conveyed separately to the nozzle through a single line which is a tube within a tube. They are mixed within the nozzle, forming a liquid spray of fan or conical shape depending on the nozzle design. By adjustment, the character of spray—its degree of coarseness and the force with which it is delivered—is easily controlled to suit the particular job.

The spray system in *Fig.* 1 employs a 5-gallon reservoir, two mixing valves, two ¼-inch lines, and two nozzles spaced 1¼ inch apart. Distance from the nozzle to the cutting tool is approximately 2 inches. Regulated air pressure is 25 psi, liquid pressure is 30 psi.

In *Fig.* 2, the system employs 12 mixing valves mounted around the tapping head. Copper tubing connects the liquid filter to the mixing valves. To each mixing valve is connected a 16-inch length of tubing with a nozzle directing the spray to an appropriate tap. By means of a solenoid valve, the spray is actuated only when the taps are approaching and contacting the work.

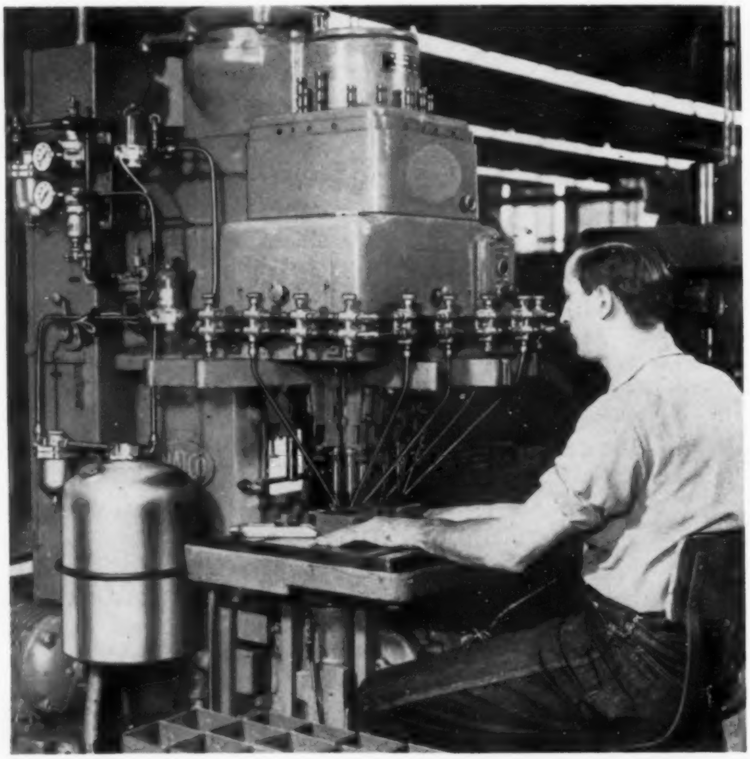

Fig. 2. Spraying lubricant at the point of cutting on tapping machine eliminates draining and wiping operations required formerly.

PROFESSIONAL EDUCATION for automation *Engineers*

By Chester Linsky*
Associate Professor
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With the advent of automation, a new branch of tool engineering has been developed—automation engineering. The author, who is in charge of automation development at a major university, proposes a four-year college program for training tool engineers in this specialized field. Reader comments on this program are invited.

During the past few years, automation has developed into a major force in the nation's economy. The dynamic growth of capital investment in highly specialized manufacturing equipment marks a definite trend away from older and less productive manual methods.

Continuous production creates many new engineering problems that cannot be solved by a conventional approach. Entirely new techniques and equipment have been worked out to provide answers to seemingly impossible parts feeding, orienting, positioning, transfer, control and other problems associated with production at faster rates and lower unit costs. These techniques have become the foundation for a series of engineering fundamentals that are of importance to a large segment of industry.

A new branch of engineering has emerged—automation engineering. Each year an increasing number of engineers has been required for the development and application of automation. The challeng-

*ASTE Member-at-large.

ing nature of this work has been both absorbing and rewarding to these engineers.

Despite these benefits, automation engineers are in short supply. As a result, equipment work has proceeded at a rate limited by the availability of technically qualified engineers. The reason for the shortage stems from the fact that engineering schools have not yet recognized this significant engineering activity. This is due, in part, to a general lack of understanding as to what the automation engineer does, the nature of his work and the special devices that are basic to his profession.

What Automation Engineers Should Know

Many dramatic advances have occurred over the past few years to add to the automation engineer's widespread knowledge. His primary function, however, remains the same—the development of devices for continuous manufacturing and assembly. Such work calls for a broad mechanical and electrical engineering background.

As a tool engineer, the automation engineer must be conversant with manufacturing processes, methods and work simplification, materials utilization, sound product design for economical manufacturing, tool design and competitive costs. As a mechanical or electrical engineer, he must understand mechanisms, functions and mechanics of materials, machine design, industrial pneumatics and hydraulics, plus automatic control devices and techniques. The essential qualifications for an automation engineer have been listed by Charles F. Hautau:

- Familiarity with the basic operating principles of all fundamental types of manufacturing equipment
- Ability to recognize the untapped production potential of each machine type, including restrictions imposed by manual operation, tooling and other factors
- Broad knowledge of electrical, hydraulic and pneumatic mechanisms, controls and components. Also, an understanding of cams and kinematics
- Understanding of product design principles
- Familiarity with the characteristics of product materials
- Acquaintance with competitive and related production processes
- Creativity—the capacity for forgetting how things have been done in the past, coupled with the ability to contribute fresh, progressive and even revolutionary ideas
- Ability to sell dynamic new concepts to management.

No standard engineering curriculum is geared to provide the right combination of knowledge to adequately prepare engineers for this work.

A new engineering curriculum, specifically designed to prepare students for automation engineering, is needed. Studies of programs in several large manufacturing companies point up a common set of functions and technical knowledge that must be acquired by prospective automation engineers. In addition to a solid background in the basic engineering arts and sciences, they should acquire a knowledge of the following subjects:

Basic Group:

- Mechanisms and their actuation
- Mechanics of materials and materials applications
- Methods engineering and work simplification
- Economics of tools and equipment
- Manufacturing and assembly process equipment
- Design of machine and tool elements

Applied Group:

- Design of products for economical production
- Design of mechanical handling, transfer and drive devices
- Engineering proposals, specifications and estimates
- Negotiations and contracts
- Operation and design of industrial actuation and control devices
- Orienting, feeding and positioning devices
- Special manufacturing and assembly equipment design
- Integrated, continuous automatic production systems.

Some of these subjects, especially those included in the basic group, are already taught in many engineering schools. With the exception of negotiations and contracts, little opportunity exists for students to acquire the information in the applied group.

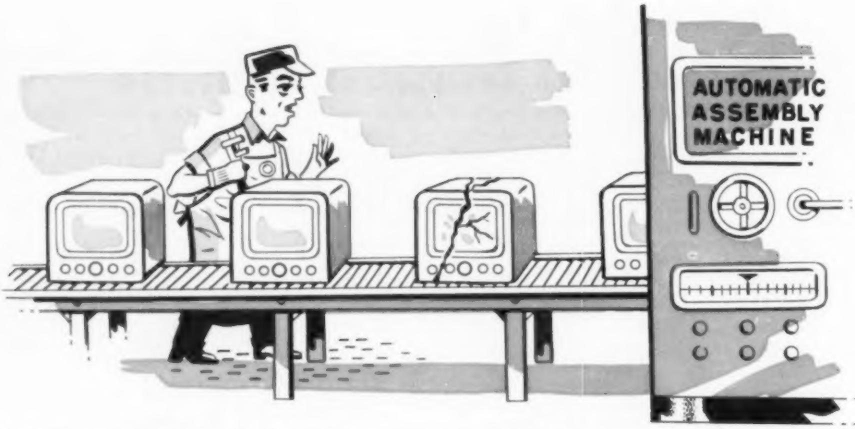
A Suggested Program

In developing a new curriculum, it is necessary to take into consideration all the knowledge a graduate is expected to accumulate to satisfy the basic requirements of the profession. To this end, the curriculum shown in the accompanying chart is suggested in the belief that it provides the optimum combination and sequence of courses for a sound grounding in essential fundamentals.

Type of Students Required: The program makes heavy demands upon students. The majority of courses are highly technical in character and the number of classroom hours required is high. Several courses are introduced at least one semester earlier than in counterpart programs and a heavy dose of professional course work is given in the senior year. To keep up with the fast pace set by the program, students should have a strong technical foundation, and better-than-average mental stamina and maturity. By restricting admission to better-than-average students, it should be possible to escape the problems imposed by classes containing students with diverse mental and emotional back-

AUTOMATION ENGINEERING CURRICULUM

College Dept.	Course Title	Hours Class	Hours Lab.	Hours Credit	College Dept.	Course Title	Hours Class	Hours Lab.	Hours Credit
	Freshman Year								
Hist.	American History	3	—	3	Govt.	American Government	3	—	3
Engl.	English Composition	3	—	3	Engl.	English Composition	3	—	3
P.E.	Physical Education	—	2	1	P.E.	Physical Education	—	2	1
Math.	Analytical Geometry and Differential Calculus	5	—	5	Math.	Integral Calculus	4	—	4
Chem.	Chemistry for Engineers	3	2	4	Chem.	Chemistry for Engineers	3	2	4
Gen. E.	Engineering Drawing and Descriptive Geometry	—	4	2	Gen. E.	Freehand Machine Sketching	—	4	2
					Gen. E.	Slide Rule and Nomography	—	2	1
				18					18
	Sophomore Year								
Lit.	Great Books in Literature	3	—	3	Soc.	Sociology	3	—	3
P.E.	Physical Education	—	2	1	P.E.	Physical Education	—	2	1
Math.	Differential Equations	4	—	4	Engl.	Engineering Reports	2	—	2
Phys.	Engineering Physics	3	2	4	M.E.	Mechanics of Materials	2	2	3
M.E.	Mechanics and Statics	3	—	3	I.E.	Manufacturing Organization	2	—	2
M.E.	Elements of Mechanisms	1	2	2	Metl.	Metallurgy	1	2	2
I.E.	Welding, Forging, Heat Treating	1	2	2	M.E.	Kinematics and Dynamics	3	—	2
					I.E.	Machine Tools	1	4	3
				19					19
	Junior Year								
Hist.	Current Events	3	—	3	Psy.	Human Relations	3	—	3
I.E.	Methods Engineering	1	4	3	I.E.	Tool Engineering	2	4	4
Auto. E.	Industrial Pneumatics and Hydraulics	2	2	3	E.E.	Electrical Engineering Applications	2	2	3
E.E.	Electrical Engineering Fundamentals	3	2	4	Auto. E.	Orientation, Feeding, Positioning Devices	1	4	3
M.E.	Advanced Machining of Metals	1	2	2	Auto. E.	Product Evaluation	—	2	1
M.E.	Machine Design Elements	3	2	4	M.E.	Machine Design	2	2	3
					I.E.	Manufacturing Engineering	1	2	2
				19					19
	Summer—Related work in industry.								
	Senior Year								
	Elective (Nontechnical)	3	—	3		Elective (Nontechnical)	3	—	3
I.E.	Economics of Tools and Equipment	2	—	2	Spch.	Speech and Conference Leadership	2	2	2
Auto. E.	Automation Equipment Development	2	4	4	Auto. E.	Automatic Control Engineering	2	4	4
E.E.	Industrial Controls and Instrumentation	2	2	3	Auto. E.	Automation System Development	1	8	5
I.E.	Materials Handling and Plant Layout	—	4	2	G.E.	Specifications, Cost Estimating, Negotiating and Contracts	2	—	2
Auto. E.	Project Proposals	1	2	2					
Auto. E.	Transfer Mechanism and Drives	1	4	3	I.E.	Advanced Manufacturing Development	1	2	2
				19					18



Continuous automatic production creates many new engineering problems that cannot be solved by a conventional approach.

grounds. Where classes meet uniformly high standards, the entire group benefits. Instruction can be geared to a high plane and a greater amount of work can be accomplished during the academic year.

Freshman Year: The first year of the program is devoted to helping the student make the transition from high school to college. It also lays a foundation for the important work ahead.

Since a student who is admitted to the program is expected to have a strong mathematics and physics background, there is little reason to repeat what should still be fresh in his mind. By the end of his first year, the student should have a good grasp of the necessary calculus to prepare him for engineering mechanics and other building-block courses that follow.

An introductory freehand sketching course is also included. Although artistic talent is apparently inborn, even the engineer who is "all thumbs" when making any kind of sketch should benefit from this course. Because of the importance of translating physical ideas onto paper, this is one of the most rewarding courses in the entire curriculum.

Sophomore Year: During the sophomore year, the student is introduced to the building-block courses that serve as springboards for the junior year. These courses include engineering reports, mechanics, mechanisms, metallurgy, mechanics of materials and manufacturing organization.

The course in engineering reports needs no justification. Numerous complaints from industry about the young engineer's inability to organize and relate technical information in written form leave no doubt about the need for a course in communication techniques.

Exposure to manufacturing processes such as machine tool operations, forging, welding and heat treating continues during the sophomore year. Knowing where a weldment can be used on a piece of apparatus to save having to make up an expensive casting, or how to design around a company's tool room limitations will pay big dividends later. Similarly, practical machine shop experience can frequently make the difference between getting a job out on time or having it fall behind schedule.

The second year completes the more theoretical phases of the program. From this point, practical applications are emphasized. A proper balance between theory and application helps to create enthusiasm. The sooner this transition can be made, the easier it is to maintain a high level of interest and sense of direction in those enrolled in the program.

Junior Year: Methods engineering is introduced at the start of the junior year to lay the groundwork for a better understanding of work simplification techniques and their value as a planning tool. Through methods planning, it is possible for a designer to develop mechanical motions as a substitute for human activity. Knowing how to line up and balance the proper sequence of manufacturing or assembly operations is an important skill for automation engineers.

A course in industrial pneumatics and hydraulics is substituted for the traditional fluid mechanics course. It is essential to thoroughly understand the theory, design and application of fluid power equipment and systems.

Another important function is designing production equipment and devices that are mechanically sound, smooth running, contain a minimum number of parts and actions to perform the necessary functions, and are easily maintained and economical to operate. The course in machine and tool design is intended to instill good design principles.

The program also provides for a course in orient-

ing, feeding and positioning devices during the junior year. The electrical, mechanical and pneumatic techniques involved are among the most complex in equipment development work. So many contingencies exist between the point of supply and final location of parts and components that only through a thorough understanding of the mechanics involved in the design of this equipment can the engineer expect to provide physically correct relationships.

A course in product evaluation is also given. Before a device can be designed or finalized, it is important that a thorough analysis of the product involved be made to determine its automation potential. Frequently, small design modifications which in no way affect the product's adequacy or customer acceptability will make automation feasible.

The engineer deals with many people. In addition to his colleagues, with whom he must frequently consult, his contacts include vendors, sales, shop, product design and production personnel. How well he is able to sell himself may affect the acceptance of his ideas. To broaden his understanding of "what makes humans tick" and the external forces that govern their activities, courses in current events and human relations are essential.

Senior Year: In his senior year, the student is exposed to the complex problems associated with relating fundamental engineering principls to equipment design. Here is knowledge of transfer machinery, automatic controls, proposals, specifications, estimating, negotiations, contracts and related subjects is developed.

Where a selection between methods, processes, tooling or equipment must be made, the problem of cost is usually involved. An erroneous appraisal can make even the smoothest-running automation system a costly mistake. The course in economics of machine tools and equipment is intended to teach the student how to appraise alternatives and make economically sound decisions.

In the course in project proposals, students learn how to successfully develop and present proposals having high acceptance potential. Before management can make a decision to approve a project, it must have complete data relative to the proposed method of operation, equipment features, approximate construction cost, anticipated hourly output, delivery date, return on investment and similar factors.

With acceptance of the project proposal, engineering designs must be prepared and approved, and each component must be completely and accurately described. Much of the fabrication may be done by vendors, so it is essential that it be properly described, negotiated and contracted for. Errors in specifications and loosely worded contracts are costly to all parties involved. The course on specifications, cost estimates, negotiations and contracts makes the student conversant with the various techniques and legalities involved.

Because of the importance of good control systems, engineers must understand the characteristics of pneumatic, hydraulic, electrical, electronic and mechanical control devices, and where one can be substituted for another to obtain actions that provide greater reliability at lowest possible cost of design, fabrication, installation and operation. They must also understand the theory and operation of numerical controls and servo devices for machine tool and process operation.

One of the major functions of an automation system is to provide automatic transfer between succeeding process stations. Whatever method is selected—rotary tables, or in-line, circular or rectangular travel, with cam, Geneva or intermittent drive—the proper selection of transfer technique and equipment is vital to the over-all efficiency of the system.

The course on transfer mechanisms and drives gives the student a thorough grounding in motion characteristics, time restrictions and energy requirements, gearing, sprockets, carrier design, pallets,

Equipment development work has had to proceed at a rate limited by the availability of qualified engineers.

chain selection, pilots, loading and transfer units. The student is also familiarized with the design and application of standard and custom-built transfer units.

A course on automation equipment and systems development is designed to show the student how to engineer a facility for given product and production requirements. First the student learns how to design individual manufacturing and assembly stations. The design of controls, interlocks, etc., is considered, with emphasis on design economy, stability,

The program makes heavy demands on students. Courses are technical and the work load is high.

construction costs and reliability. This is followed by the design of a completely integrated system with the necessary provisions for transfer, fixturing, processing, actuation and control. In this final phase of the program, problems of construction, debugging and reliability are studied as a prelude to the actual problems the student will face in industry.

During his last semester, the student is assigned the task of developing a complete system under the combined supervision and guidance of the academic staff and engineers from cooperating companies. This project calls upon all his knowledge of mechanisms, materials, machine and tool design, controls, costs, standards and related factors. When the project has been completed, the basic preparation of the student has been completed as far as time will allow, and he is ready to take his place in industry.

The student is not, of course, qualified to take over full responsibility for the design of automation facilities. He will require several years of experience before he can consider himself a qualified automation engineer. Nevertheless, the program does offer a well-coordinated exposure to fundamental engineering considerations and will materially enhance his competence, value to his organization and leadership characteristics.

Implementing the Program

The staff members who carry out the advanced phases of the engineering program should have a broad background in automation equipment design and engineering with larger industrial organizations. They should be conversant with the tools and techniques related to control, processing, design, tooling, feeding and transfer.

Laboratory work will play an important part in the successful implementation of the program. With the exception of a controls laboratory, which should be added to the electrical engineering facilities, and an advanced manufacturing engineering laboratory in the tool engineering department, the other service laboratories already exist in most engineering schools.

Eventually, five new laboratories should be added: a fluid power laboratory, a parts handling and feeding laboratory, a product analysis laboratory, a laboratory for equipment development and a pilot-plant laboratory. In addition, an equipment development shop is desirable.

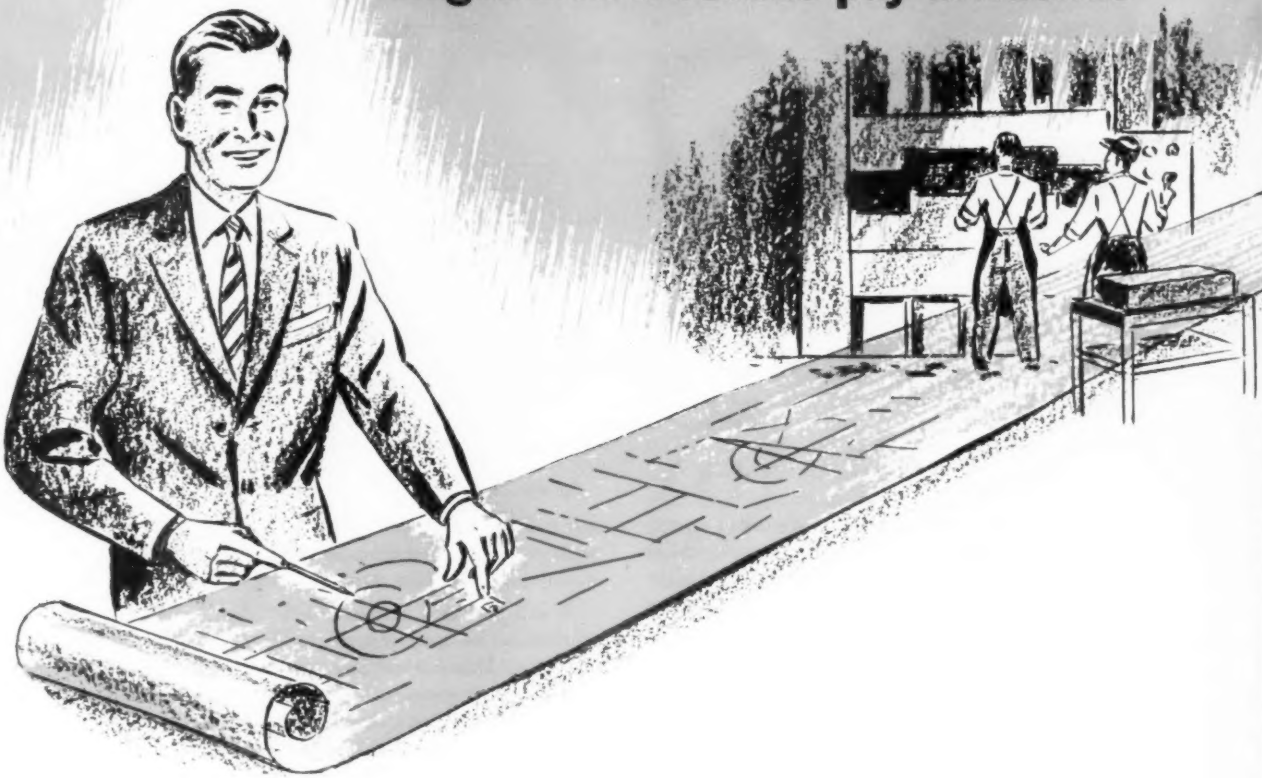
Equipment in the equipment development laboratory could include a collection of typical automation devices such as transfer and assembly equipment, speed reducers, feeders, control and actuation devices, and similar items. The function of this laboratory is to provide opportunities for the study, design and fabrication of automation devices. Experimental analysis of various prime movers, transfer, control, feeding, positioning, and fabricating and assembly devices will provide the student with a sound appreciation of the fundamental techniques involved.

The pilot-plant laboratory is intended for the study of equipment under simulated operating conditions. This makes it possible to conduct analytical studies on performance data, reliability, energy requirements and debugging problems.

An important function of the automation engineering department, once it is in operation, is research work. Industry has an insatiable need for newer and better components and process techniques. The university laboratory is excellent for this type of study. There are enough projects waiting to be studied to keep a graduate program going indefinitely.

PROCESS PLANNING

...organized methods pay dividends



By James H. Greene
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TESTIMONIALS to inefficient methods of process planning are the scrap heaps in the factory and the profit and loss statements. These scrap heaps and low profits need not exist if the process planners are willing to use a logical working system rather than the unreliable hit-or-miss method.

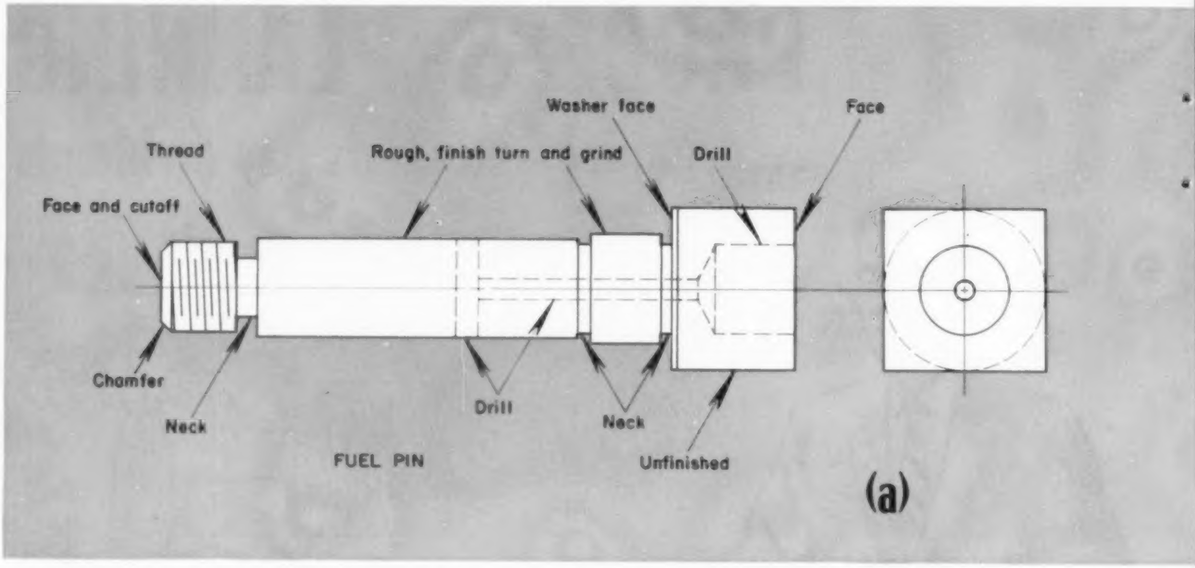
This unsatisfactory method of process planning consists of thinking of the product process in its entirety and trying to conceive the whole production picture at one time. Mentally the process planner juggles all the available information concerning raw materials, plant equipment, quality desired, and other bits of information which he has accumulated over the years. From this stewing pot he precipitates a processing plan which he hopes will culminate in generous profits for his company.

The step-by-step procedure of process planning, however, is a simple form of logic which can be systemized. This method will prevent many expensive blunders and decrease costly planning time. What is more, this system makes an excellent methodology which can be readily taught to the new process planner in a short time, thereby reducing many hours of costly learning time.

Process planning is the technique of predetermining the most suitable materials and methods to produce a product of a required quality at a minimum cost. In industry, this takes the form of written instructions to the workers and is frequently called an instruction sheet, an operation sheet or a route sheet. Along with the blueprint, or other representation of the product, this instruction sheet tells the worker how the product is made, step-by-step.

The process can be defined as all of the work done on a product from the time it leaves a controlled storage point until the time it returns to controlled storage.

The process, a comprehensive term, is made up of



Steps in process planning: (a) list suboperations; (b) determine grouping of suboperations; (c) determine sequence of operations.

"building blocks" which are generally called operations. These operations are the instructions which are applied to one work area. They apply to a single worker on an engine lathe, several workers on a press or one worker operating several automatic screw machines. The key to whether it is an operation or not is to determine whether or not just one instruction needs to be given. Or, to think of it in another way, can it be handled by just one set of time card entries?

As the process can be broken down into units of operations, so can the operations be divided into suboperations. A suboperation can be defined as work which is done without interruption. For example, drill, paint, burr, broach and mill are all typical common suboperations in the metalworking industry.

The logic of process planning can be stated as a step-by-step procedure:

1. Determine, in a systematic method, all of the suboperations required to produce a product
2. Group the suboperations into logical operations
3. Place all of the operations in their proper sequence for the process.

To show how this method works in actual practice, a common part such as the fuel pin illustrated may be considered. The first step is to list every building-block suboperation. Listing of the suboperations could be on a hit-or-miss basis but, when one thinks what it might cost if just one is omitted, it immediately becomes apparent that a system should be set up. There are many methods which could be used but in the example the suboperations are listed from left to right with each surface being numbered. The sequence of suboperations is of no concern; the important thing is to list them all.

It will probably be desirable to identify the suboperations by referring to the dimensions of the blueprint. This method has one inherent danger in that the shop personnel may produce the product to the specifications written on the instruction sheet and not to the specifications of the blueprint, which might have changed. This can be especially troublesome when there are many drawing changes which never get to the instruction sheets. Ideally, dimensions should not be used. Actually, it is often the only practical method of identifying surfaces.

The next step is to group the suboperations into likely operations, as illustrated. Again, there is no need to place the suboperations into any sequence order. Placing them in order would be meaningless where several suboperations are to be done simultaneously. Also the sequence can be determined best by the operator or setup man.

The operations must, however, be placed in their proper sequence and this is the next step in process planning. This is an important step as there are many factors to be taken into consideration. Some of these general factors, or "sequence criteria," will be considered briefly to point up their importance.

1. *Plant layout:* The process should generally cause the product to travel the shortest distance. Therefore, the operation sequence should make this possible.
2. *Reference surfaces:* Where dimensions are interrelated, it is necessary to place the operations in the

GROUPING OF SUBOPERATIONS

Face and cutoff, chamfer, thread, neck, rough and finish turn, small diameter, neck, rough and finish turn, large diameter, washer face.

Grind (small diameter)
Grind (large diameter)
Drill (lateral hole)
Drill, drill (concentric holes)

(b)

SEQUENCE OF OPERATIONS

Op. 10. Face and cutoff, chamfer, thread, neck, rough and finish turn, small diameter, turn, neck, rough and finish large diameter, washer face.
Op. 20. Drill (lateral hole)
Op. 30. Drill, drill (concentric holes)
Op. 40. Grind (large diameter)
Op. 50. Grind (small diameter)

(c)

proper sequence to attain the requirements specified on the blueprints.

3. *Physical requirements:* First things must come first. For example, holes must be drilled before they are tapped.
4. *Cost of operations:* If a product is apt to be scrapped during the process, then all costly operations should be deferred to the last.

There are other sequencing criteria but the preceding will give an idea of what must be kept in mind while determining the process planning sequence. The final arrangement of the operations in a process is shown as Sequence of Operations in the chart.

The process planner following haphazard methods may evolve the same answer as the person using the logic method described but, in following this methodology, fewer costly omissions of necessary operations will be made. The method is suitable for any industry and is not restricted to the metalworking industry alone. There are many industries with well established and defined suboperations which can be logically formed into operations which in turn can be placed into a processing sequence.

The methodology proposed will help reduce the errors in process planning, which in turn will improve scheduling, estimating, quality control, and practically every other facet of the industrial system.

Organized Centralization Speeds Heat-Treat Jobs

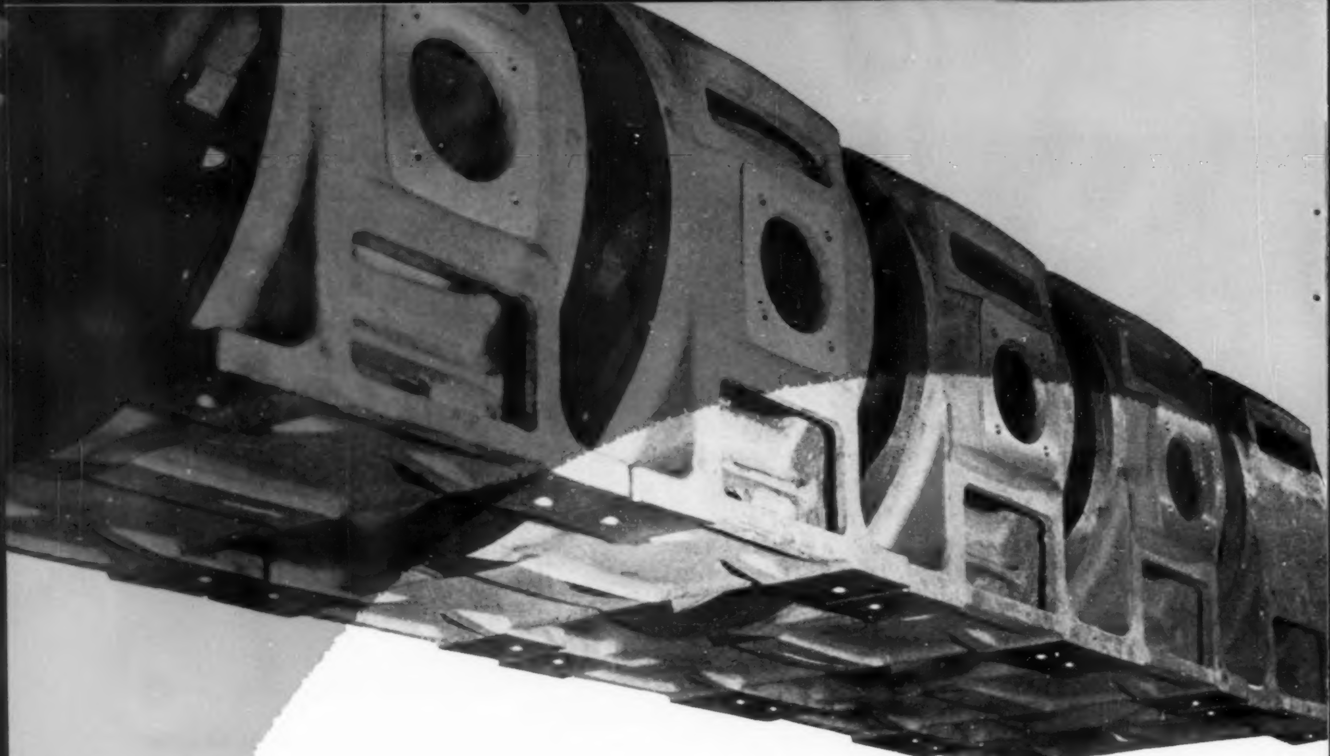
BY REMOVING temperature controls from the heat-treating floor to a centralized room overlooking the operations, the National Cash Register Co. has simplified the job of heat-treating 900-million parts a year.

From the centralized location, one man receives records of incoming jobs, schedules the heat-treats, sets control temperatures, and posts the job number and time in and out of the furnace on the instrument chart.

Operations include carburizing, hardening, tempering, annealing and copper brazing. Furnaces, both batch and continuous types, include gas carburizers, cyanide pots, salt pots, lead pots, bell annealers, draw furnaces, induction heaters and sintering equipment. Parts are made of various steels ranging from low-carbon strip to alloys.

Mechanized conveyors move work, with its identifying job sheet, into the heat-treat department, while a copy of the identifying form also goes to the control-room operator. Filed in the control room is an operation card for each part which gives its particular heat-treat specifications. With the job at hand identified, the operator merely pulls the proper index card, determines the heat-treat required, and sets the control point setter on the controller for the furnace to be used. By Teletalk, he notifies the furnace man on the heat-treat floor that the job is ready to go, and posts the job number on the instrument chart, as well as the time in and time due out.

The floor man then loads the furnace. When the job is finished, the operator again contacts him by Teletalk, and he unloads the furnace.

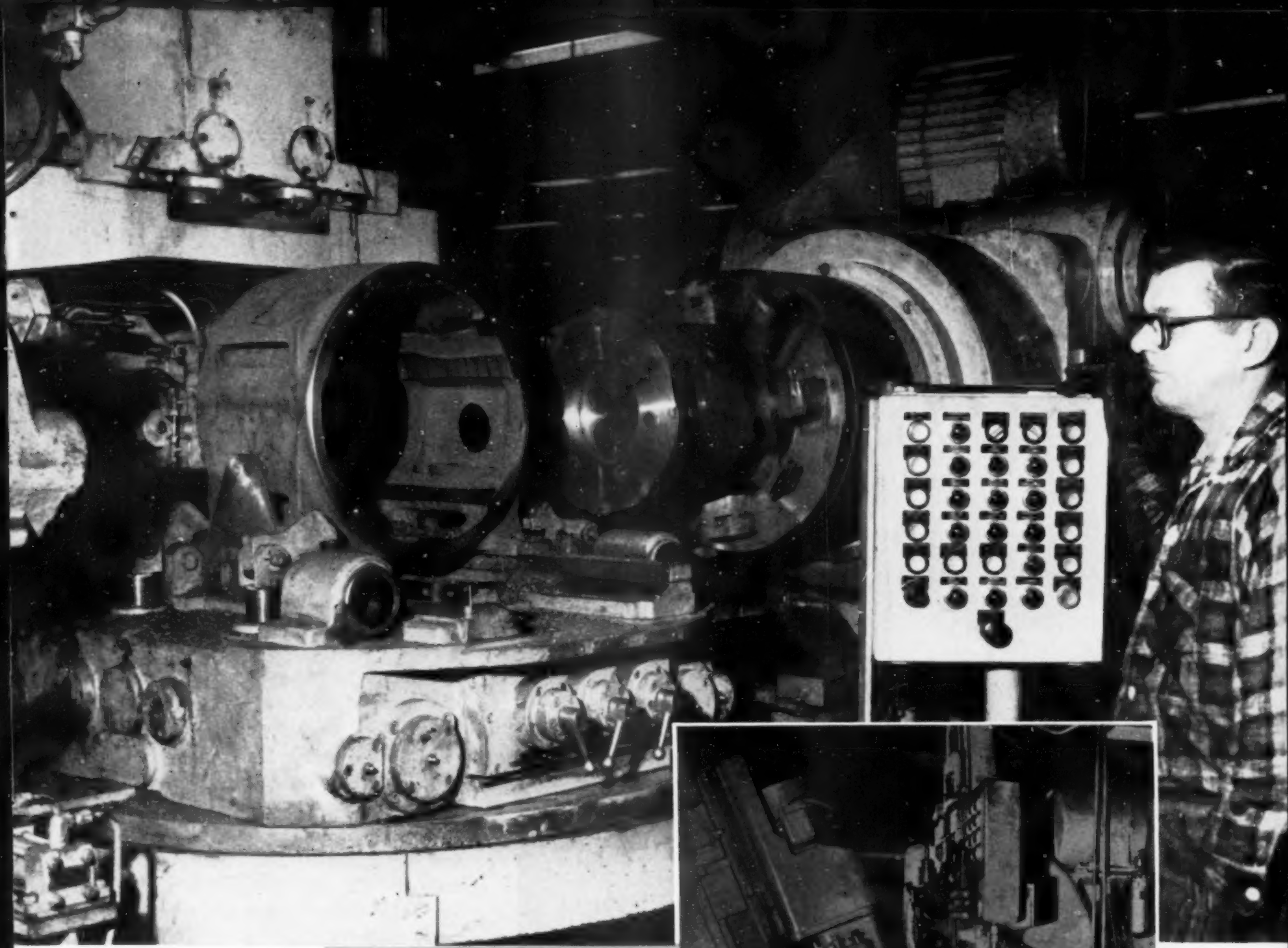


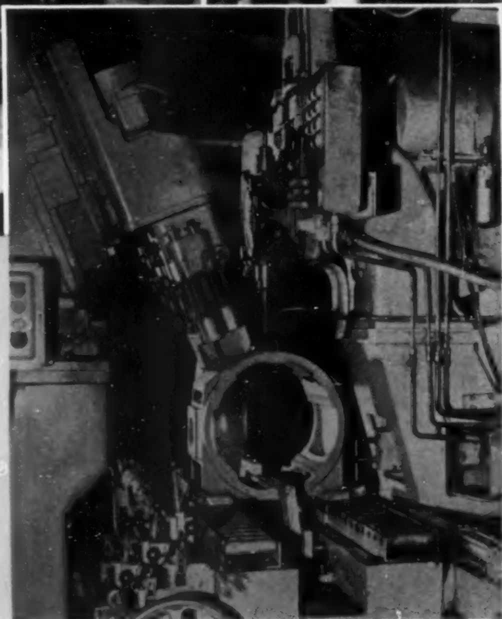
Mechanized Production Cuts Costs
. . . . at new electric motor plant

Although some business and government leaders have been troubled by recent economic uncertainties, General Electric Co. executives forecast a growing economy and a continuing trend toward automation during the next few years. To prepare for this growth, the small a-c motor and generator dept. of General Electric's Motor and Generator Div., Schenectady, N. Y., has opened a new plant for the production of electric motors in the 40 to 125-hp range.

Less than one third of the motors in the range are standard designs; however, mechanization has been applied extensively in the plant. This mechanization has been made possible by designing standardized motor parts that can be produced in volume and assembled in various combinations.

Two buildings are involved in the production of these motors. One building houses equipment to perform various automatic machining operations. These operations occupy 60,000 square feet of space. The machined components are loaded on an enclosed conveyor that carries them to a 170,000-square-foot assembly building. After entering the assembly area, the conveyor travels to "drop-off" points at various locations in the plant. At these points, motor frames, shafts, and end shields and other components are removed from the conveyor for assembly. The separation of machining and assembly insures against cast-iron dust getting into the assembly. Some of the operations in the plants are shown in the following pages.

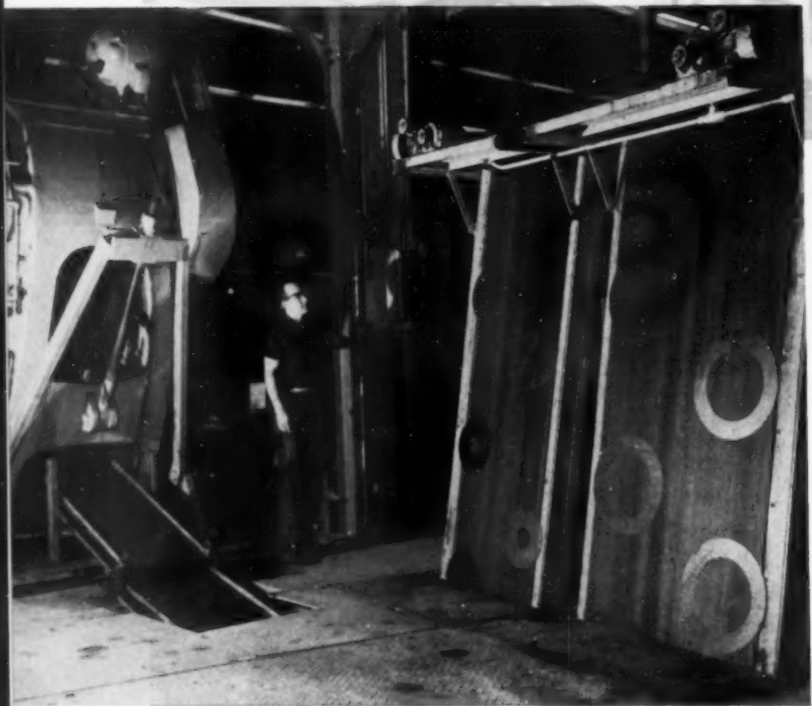




THE NEED TO TRANSFER cast-iron frame castings through eight separate machining operations has been eliminated by this semiautomatic machine, which bores, cuts, drills and taps the castings prior to final finishing. Three standard frame sizes can be accommodated. When a frame is put on the machine, probes check the frame size and necessary machine adjustments are made automatically. Another automated machine for drilling and tapping frames is shown at right. All parts follow the same flow during machining. Components for special motors are machined on conventional equipment in an area adjacent to the semi-automatic machining line.

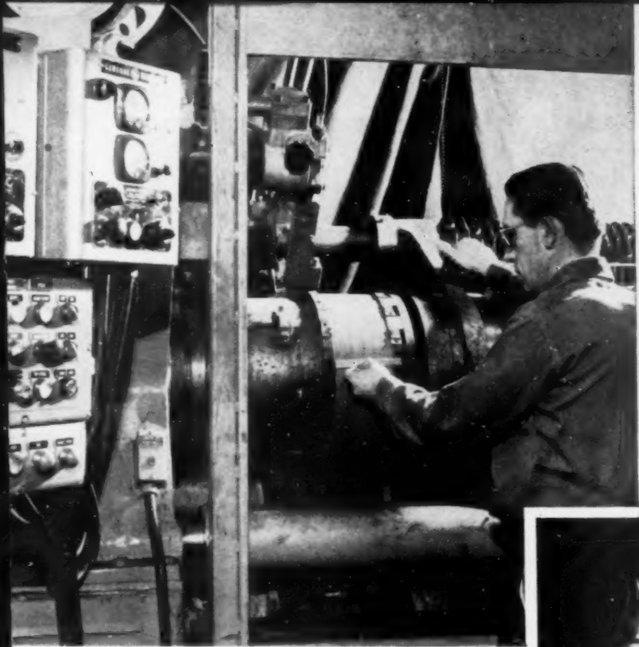
TOOLS at work

TOOLS at work



All presses in the rotor and stator stamping area are fed automatically. First press in the line is a 250-ton double blanking press. Blanks are stamped out of coiled silicon steel. Trimmings are removed from the press area by a conveyor. Blanks travel to one of three 90-ton separating presses where rotor and stator blanks are produced. A system of underfloor belt conveyors, magnetic-lift belt conveyors and overhead live-roll conveyors transports all stampings to the next operation in line. This fast, automatic handling keeps materials clean and minimizes the possibility of damage.

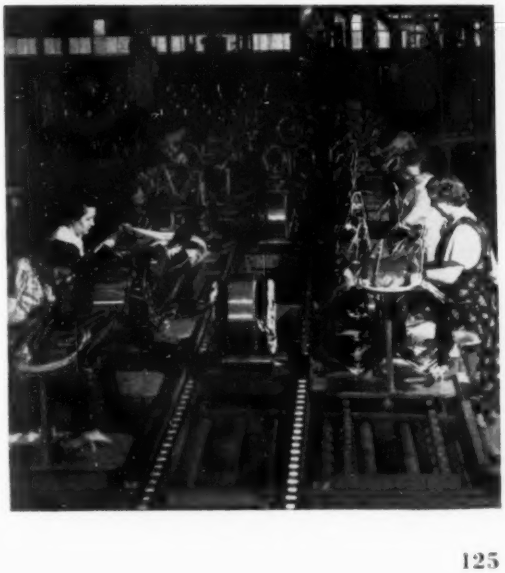
Stator and rotor stampings are stored on spindles in General Electric's new motor plant. Storage is kept at desired level by overhead transfer system that shunts blanks to the proper spindles. Operator takes blanks from spindles as required, inserts them in punch press for notching. This is the final stamping operation.

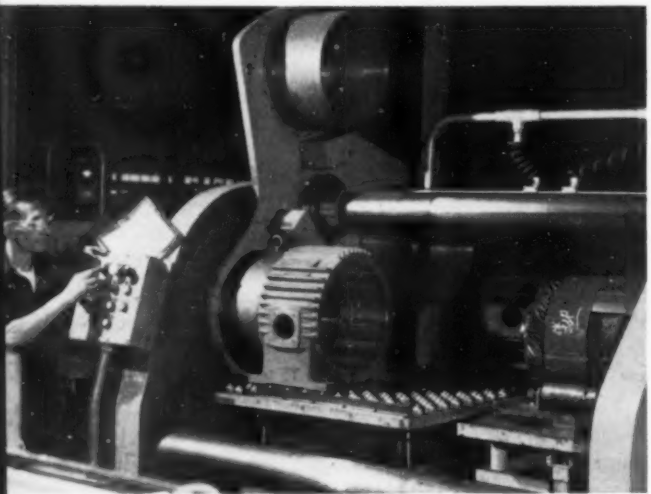


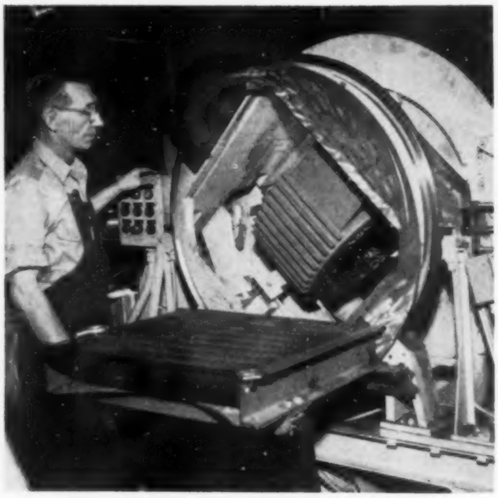
Stator stampings are assembled into motor cores and welded in this automatic machine. Using the Fillerarc process, the equipment welds on both forward and return strokes of the electrode. Twelve welds are made on each core assembly. Following welding, cores are fed into an annealing oven in batches. Magnetic properties are controlled by a system of zone control in the annealing oven. After core-loss tests, stator cores are loaded into a machine for finish turning the outside diameters. Chips are collected by a vacuum system during machining.

Punched tape is used to control the automatic coil-winding machine in new General Electric motor plant. The machine insures properly wound coils of the right form with the correct amount of turns. It virtually eliminates the possibility of human error in coil winding and greatly improves the efficiency of this operation.

Stator cores, coils and insulation are delivered to assembly area by conveyor in the General Electric motor plant. Here coils and insulators are inserted into the stator cores and the work is transferred by conveyor to individual work stations where cables and leads are connected, and the flare of the windings is formed and tied. Each operator performs all assembly operations on individual units. When a unit has been assembled, it is shunted onto center conveyor and forwarded to the next operation. Operator then pushes a button and another unit is delivered to her station for assembly. A system of interlocks prevents the units from bumping into each other on the conveyor. This assembly operation is followed by electrical testing. Wound stators are sent through an automatic dip-and-bake operation subsequent to testing. The silicon dip gives resistance to moisture. Testing parts and assemblies during manufacture assures quality of finished motors.







STATOR ASSEMBLIES are pressed into frames under 25 tons of pressure in special machine located in General Electric's small a-c motor and generator department. All frame sizes manufactured in the new facility can be accommodated in this press. High pressure used in assembly assures a distortion-free fit. After stator has been mated to frame, the assembly is transferred to dowel drilling machine, which rotates the frame 180 degrees. All drilling and positioning is automatic.

TOOLS at work

IN FINAL assembly area, rotors and end shields are positioned vertically. Vertical assembly assures less noise in bearings and improves the efficiency of component handling. Completed motors are placed on a shuttle mechanism and transported through the final test area where resistance, impedance, high-potential, surge and sonic tests are given each motor.

finishing surfaces by VIBRATION

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Fig. 1. Vibratory lapping machine being used to finish a number of light rings.

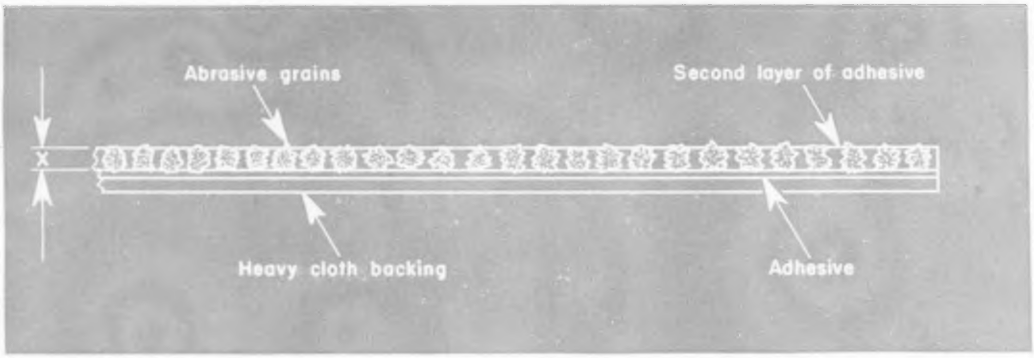
Production type vibratory lapping machines generate surface finishes as smooth as three microinches. Flatness is held to within three helium light bands. Productivity is high as compared to manual lapping.

Until recently, the only techniques available for lapping flat surfaces were: tedious hand lapping on a stationary plate; holding the workpiece by hand on a revolving plate; and mechanical lapping of parts rotated under pressure over a revolving plate. Surfaces can now be lapped flat and smooth by means of vibratory action. Surface finishes of better than three microinches rms, and flatness within three helium light bands have been attained by this vibratory technique.

The application involved in the development of the vibratory lapping technique was the production lapping of bronze and stainless steel rings for mechanical shaft seals. A vibratory lapping machine, *Fig.* 1, representing a new and relatively inexpensive type of lapping equipment, proved capable of producing lapped surfaces of an optimum degree of surface accuracy. The operator need only load and unload the machine, and is therefore free to do other work.

The machine is comprised of a drive unit, a separate controller and a lapping bowl or pan. A sheet of abrasive cloth is cemented to the bottom of the pan. Light oil is used as a lubricant and is preferably recirculated through a pump and filter system to prevent the abrasive cloth from becoming coated. Parts are held down on the abrasive by means of one or more pressure plates.

The drive mechanism contains no rotating parts. It consists of a heavy base unit housing an electromagnet, which is energized by pulsating direct current. Thus, from an input current frequency of 60 cps, the armature of the electromagnet is vibrated at a frequency of 3600 vibrations per minute. The lapping pan, which is attached to the armature, vibrates at the same rate. This provides a horizontal rotational component to the vibratory motion and provides the polishing action. A vertical component causes a rotary effect, or forward movement of the parts within the lapping pan. This movement is produced by a coordinated leaf spring system, mounted at a prescribed angle and flexed in con-



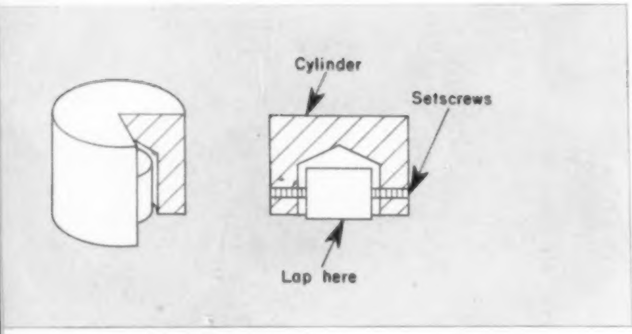


Fig. 2 (above) Manufactured abrasive disk used in vibratory lapping machine. Cutting action is constant throughout distance X.

Fig. 3. (left) Pressure cylinder used for adding weight to metallographic specimens.

junction with the horizontal vibratory motion. The vibratory amplitude is adjustable through rheostat control, enabling a group of parts to be lapped at the most effective rate of circular travel.

The combination of drive mechanism components causes the parts to flow smoothly around the bottom of the pan. This vibratory action is of such a gentle nature that there is no chance for a change in temperature which would affect the lapped surface.

Lapping pans may range from 5 to 30 inches in diameter and be either a machined casting or a machined stainless steel bottom plate with a fabricated stainless steel wall. The wall contains an outlet for use with a recirculatory pump and filter system. A coated abrasive disk is cemented onto the flat bottom surface of the lapping pan, *Fig.* 2. The disk normally consists of either silicon-carbide or aluminum-oxide particles. Grit sizes from 60 to 600 are available. For special applications other types of abrasive cloth can be made available.

The advantage of using abrasive cloth is the fact that, once worn out, the cloth can be removed with a solvent and replaced with a new sheet of abrasive. There is never any need for reconditioning the lapping surface.

For some applications, it is more advantageous to use a cast-iron insert, charged with a suitable lapping compound, rather than abrasive cloth. These inserts are readily removable for refacing and reconditioning and interchangeable with other plates charged with the same or different compound.

One of the most important factors involved in efficient lapping is the utilization of a correctly designed weight or pressure plate. A quantity of parts, placed on top of an abrasive cloth selected for the application, can be covered with a single cover-like pressure plate. Plate diameters range from 2 inches for metallagraphic specimens, *Fig.* 3, to 12 inches for covering a large quantity of small flat pieces, *Fig.* 4. Plates are designed to produce a minimum pressure of one half pound per square inch of surface being lapped. In general, heavier weights tend to produce a faster lapping action.

To obtain optimum flatness, all parts of the same height should be placed under the largest available pressure plate. The thickness of the plate can be varied, depending upon the lapping area and material of the parts, by adding or removing weights. Various types of metals can be lapped simultaneously. Each of four or five pressure plates can cover a different group of parts with the parts in each group consisting of a different metal.

Applications involving intricately shaped parts require either specially designed pressure plates with appropriate machined recesses, or special holding fixtures for use underneath the pressure plates. Large heavy pieces *Fig.* 5, are lapped without the aid of additional pressure or confinement.

By utilizing specially designed spoke-like holding fixtures underneath the standard pressure plates, satisfactory lapping results have been attained on cylindrical surfaces in a single operation. There is no need for repositioning the cylindrical parts end for end within the jig, since the gradual rotation of the entire pressure plate continually maneuvers the individual pieces from the innermost location,

relative to the bowl center, to a point next to the bowl wall. This rule applies whenever multiple pressure plates can be used in a single pan. For an application involving a single pressure plate filling the entire pan area, it is necessary that the individual pieces be repositioned end for end in order that all points may be subjected to the same action.

For parts which are to be lapped on only one side, the pressure plate may contain a layer of gasket material, heavy felt, or hard rubber on its underside to accommodate height variations. Parts which must be lapped parallel within close tolerances, i.e., within a few ten thousandths of an inch, are lapped under a pressure plate which has itself been lapped.

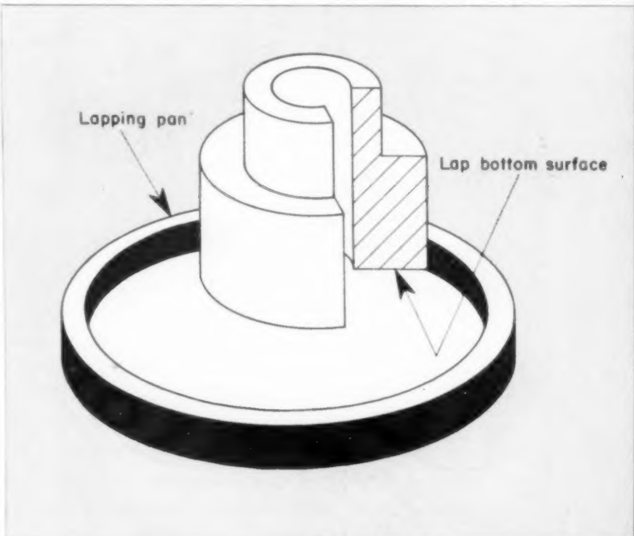
A precision surface is produced by the continual three-way rotation, *Fig.* 6, or three separate motions to which the lapped pieces are subjected. These three motions include, simultaneously, the rotation of the pressure plates around the outer rim of the lapping pan, the gradual rotation of the individual pressure plates about their own axes, and the rotation of the individual pieces under the pressure plate about their axes.

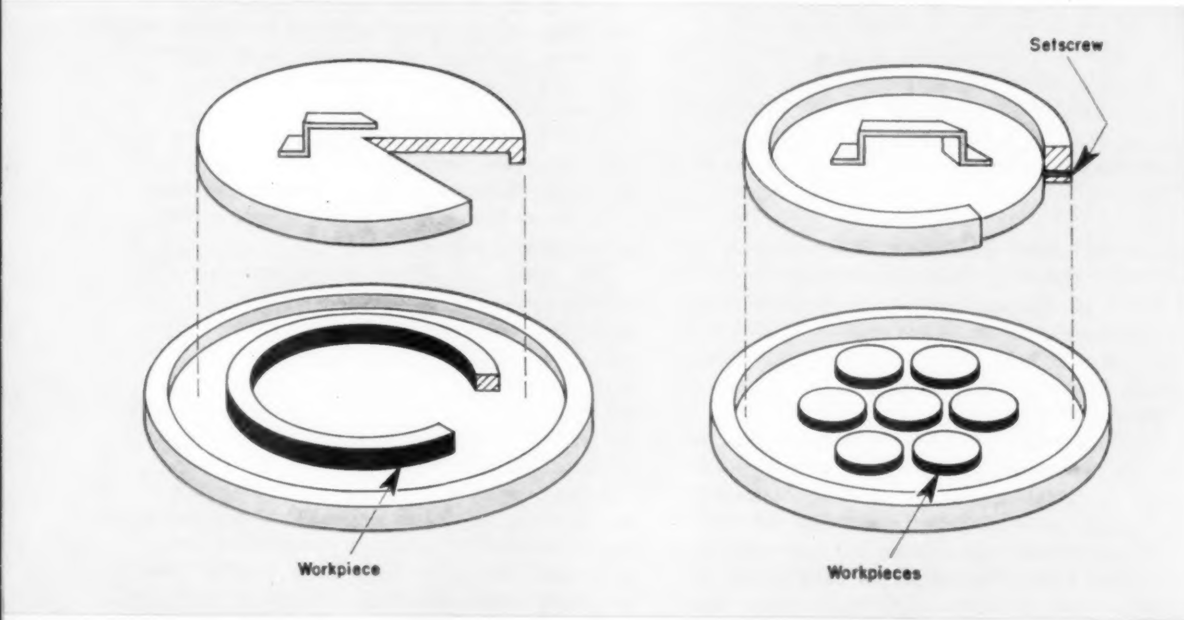
This three-way motion is available for round pieces by placing them side by side under a standard pressure plate. Parts with square, rectangular, or various other shapes can be subjected to the same multimotion action by being surrounded with a fixture, drilled or punched to suit the individual pieces. This fixture should be thinner than the overall height of the parts, and of approximately the same diameter as the pressure plate.

Thirty minutes is required for lapping hard phospor brone rings. This cycle time is sufficient to lap the parts from a screw machine cutoff finish of from 15 to 30 microinches to less than eleven microinches rms. Four groups of one-inch OD parts are lapped simultaneously under four pressure plates, each 12 inches in diameter. Output is 424 pieces per finishing cycle, or an average of 14

Fig. 4. (below) Pressure plates cover a single large light part or a quantity of parts. Plate on right is adjustable for use with different thicknesses of parts.

Fig. 5 (right) Large heavy piece can be lapped without a pressure plate.





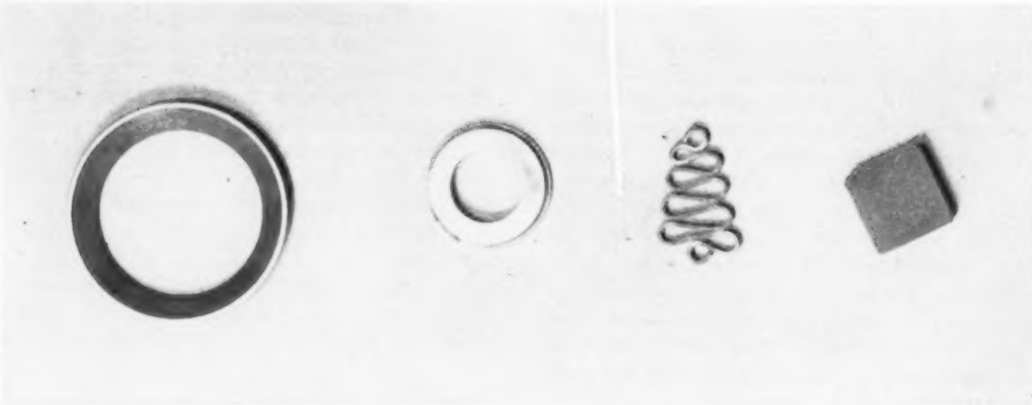


Fig. 7. Examples of parts finished by vibratory lapping technique. Standard pressure plates may be used on round parts. Square or irregularly shaped parts require special fixtures.

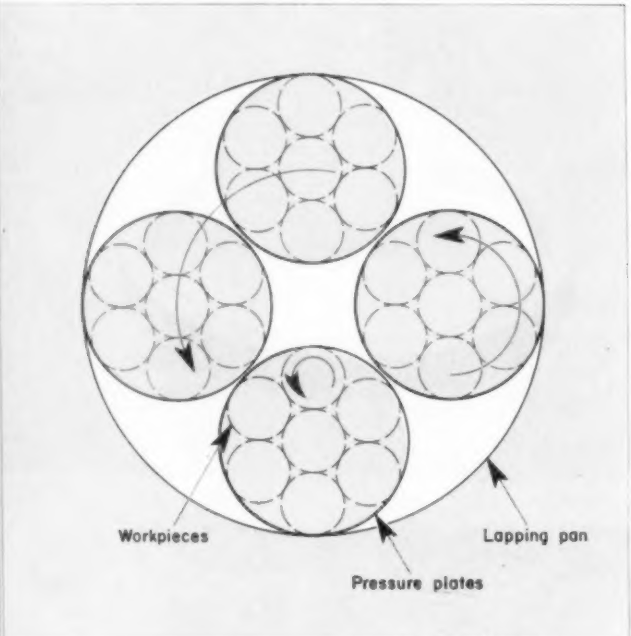


Fig. 6. Parts are subjected to a continual three-way motion providing an even distribution of lapping action.

pieces per minute. This operation is carried out on a 320-grit aluminum oxide abrasive cloth.

For type 316 stainless steel and monel rings, approximately two hours are required to reduce a 15 to 30-microinch machine finish to seven microinches rms, or better. The abrasive cloth used is the same as for the bronze rings.

The versatility of the vibratory machine can be seen in the polishing of metallographic specimens. After an initial lapping period of approximately ten minutes on a 400-grit silicon-carbide or aluminum-oxide abrasive cloth, depending upon the specimen alloy, a 30 to 180-minute polishing period will prepare parts for microscopic examination. This final polishing operation is generally carried out on a white felt cloth, usually $\frac{1}{16}$ inch thick, which is charged with a suitable finishing compound. The specimens are placed in individual holding fixtures or collars, *Fig.* 3, which add necessary weight to the parts. Individual fixtures are required primarily because of the over-all height variations of metallographic specimens.

Carbide tip parts have been successfully lapped, after a rough diamond-wheel grinding operation, to a finish of five to seven microinches rms and a flatness of three to five helium light bands. This can be accomplished in 30 to 60 minutes depending upon the accuracy of the rough-ground surface.

Only a few minutes is required to deburr most stampings and ornamental pieces such as medal or ring parts. A rubber undercovering on the pressure plate is used in order not to mar the top faces of the parts involved.

Another production application is the lapping of valve gates and seats, from 2 inches up to and including 24 inches in size. After a 15-minute cycle, the surfaces are suitable for holding pressure across the gate and valve seat.

The lapping of silicon wafers represents still another use for the vibratory lapping unit. For this application a cast-iron insert is used in conjunction with a suitable lapping slurry. A quantity of parts is surrounded by a holding ring and covered by a felt-padded pressure plate to help prevent cracking the wafers or chipping their edges. The rate of stock removal is approximately 0.004 inch per hour.

A large variety of parts, *Fig.* 7, are adaptable to the vibratory lapping technique. Optimum results can be attained by utilizing a correct combination of abrasive cloth or cast-iron insert, pressure plate or holding fixture, and time.

building for the future

By J. Frederick Parr
Assistant Editor

Embodying the latest techniques in modern plant construction, Leeds and Northrup's North Wales, Pa. plant is designed with expansion and flexibility as prime considerations. This article previews one of the outstanding plant tours offered to ASTE members at the Annual Meeting.

General industrial growth has brought expansion problems to many manufacturing concerns. Usually increases in production requirements do not appear overnight. They accrue in small increments until major expansion becomes necessary. Faced with the problem of continuous incremental growth, Leeds and Northrup of Philadelphia, Pa. undertook construction of new facilities to provide for their present and future needs.

Plant Planning

Three major considerations dominated plans for new building: efficient production of present products, easy rearrangement of facilities to meet new needs, and economical expandability of new buildings. Two and one half years were spent in selecting a site and planning facilities which would be adequate for substantial expansion for many years to come.

Ground was broken late in 1954 and a new plant at North Wales, Pa., was in full scale operation by May 1956. The plant now covers approximately 7½ acres on a tract of 129 acres. The plant has a central supervisory system that shows watchman activity, as well as any sprinkler action, fire alarm, or change in valve positions. The roof and walls are insulated and the roof can be water-cooled. Expansion joints in floors dampen vibration where required. Departments for heat-treating, painting and certain other operations have their own heating and ventilating systems.

Since it was not feasible to shift all manufacturing to North Wales at once, a division of activities was selected to make both the Philadelphia and the North Wales plants as self-sustaining as possible and reduce communications and travel to a minimum.

Recorders and recorder-controllers including nonpurchase parts and components and complete panel assemblies for load frequency control and combustion control are produced and assembled in the

Fig. 1. Testing the operation of an atomic reactor simulator, to be used for teaching reactor operation at a technical institute. Instruments behave precisely as they would in controlling a real reactor.

North Wales plant. Markets for products include instrumentation for metal refining, metalworking, central power stations, chemical and petroleum manufacture, scientific teaching, design and engineering testing, clay and glass processing and pharmaceutical manufacture.

Three-quarters of all special customer orders are also processed at North Wales. Some examples of these special custom type items are atomic reactor controls and simulators, *Fig* 1, and equipment for control of electric power for the St. Lawrence Seaway, *Fig* 2.

In order to efficiently manufacture present products, the utmost in machine tool versatility and effective utilization of floor space are necessary. Much of the instrument and control manufacture takes the form of a mammoth job-shop operation. Large lot production runs of controls or even parts are a rarity. Setups on stamping machines, for instance, are changed several times a day. Many instruments are special and sometimes require one-of-a-kind parts. Even "standard" instruments have thousands of different combinations of parts and subassemblies. Constant attention must be paid to distributing the work flow and arranging floor space to suit the varying requirements. Thus machinery

Fig. 2. A portion of equipment being assembled for control of operations of the St. Lawrence Seaway.

and equipment has been selected for maximum flexibility. The purchase of raw materials is carefully controlled and purchased metal shapes are selected for minimum machining. Preliminary operations of sawing and slitting are done in the receiving and storage area.

Easy rearrangement of existing facilities to meet new needs has been accomplished by minimizing the amount of permanent structures and obstacles on the production floor. All plant services such as air, steam and electrical supply lines are overhead. Toilet facilities are on mezzanines. Internal walls have been kept to a minimum to provide as large an open space as is possible.

One of the main features of the plant is expandability. The site itself, *Fig* 3, is sufficiently large to accommodate almost unlimited expansion. The outer walls are constructed so that they may be moved with a minimum of destruction and repair. One physical expansion of the plant has already taken place. Recently approximately one acre of warehouse space was added. New concrete was poured for the floor. The siding and window frames were dismantled and the brick was taken down. The brick was rebuilt at the new location and the siding and window frames reassembled.

Plant services such as power steam, air and water lines are all oversized and new areas may be tapped onto the existing service lines and electrical bus without taxing their capacities. Service equipment such as boilers, compressors and even dishwashers are oversize and were carefully selected to provide ease in connection of parallel units. This expandability will make it possible to eventually transfer all manufacturing operations from the Philadelphia plant to the new plant.

Production Methods

Although job-shop techniques must be applied in manufacture of individual instruments, some semi-production methods may be utilized. Assembly of complete instrumentation systems for power plants, cement kilns, wind tunnels, computers, steel mills, oil and chemical plants and nuclear reactors does not lend itself to any usual mass process methods since all these are normally custom made. Here the key to efficient operation is good planning and the skill of the workmen responsible for assembly and testing. Many times they must devise their own test methods and equipment and rely on their knowledge and experience to produce a perfectly functioning assembly.

Job-shop problems are also encountered in the manufacture of plastic parts. Many suppliers were reluctant or unwilling to produce parts in the relatively small quantities required for instrument manufacture. A plastics shop was set up and equipped with standard molding machines. The Tool Department designed and built the required dies. The company is now producing over 200 different plastic parts for its own use. The plastics shop has been so successful that requests have been made by other firms that the facilities be made available for outside contract work.

Materials handling is an important problem in low volume production. Thousands of variations of

Fig. 3. Leeds and Northrup plant at North Wales, Pa. Site is large enough for almost unlimited plant expansion.

one type instrument are possible. Many instruments require long periods for assembly. The wiring of a switching unit alone, *Fig.* 4, may take over 30 hours to complete even when accomplished by the most experienced worker. Special-order instruments, processed in a separate assembly section, require time-consuming hand-fitting and adjustment. All instruments are tested under operational conditions where they must perform satisfactorily for at least 24 hours, *Fig.* 5. Conveyors or multiple work racks are not usable. Each instrument is mounted on an individual truck, *Fig.* 6, in order to eliminate lifting and reduce handling to a minimum. The instrument cases are bolted to the trucks on which they remain from the beginning of mechanical assembly to crating and shipment. The trucks have clamping brackets attached for fastening them to workbenches while assembly and wiring operations are performed.

Manufacturing Planning

At present all tool making and tool designing are done at North Wales. Tools are manufactured by outside firms only when new programs cause overloading of available facilities.

A tool scheduling arrangement has evolved over several years. Recently, in an effort to reduce paperwork time, one form, *Fig.* 7, was designed to carry all information connected with a tool order. This form is printed with duplicating paper attached so additional copies may be made readily.

When new products or parts are ready to go into production, members of the methods section and tool section of the industrial engineering department meet with representatives of the product engineering department. Possible improvements in design from the manufacturing standpoint are discussed. After any necessary design changes are made, methods and tooling engineers meet again to

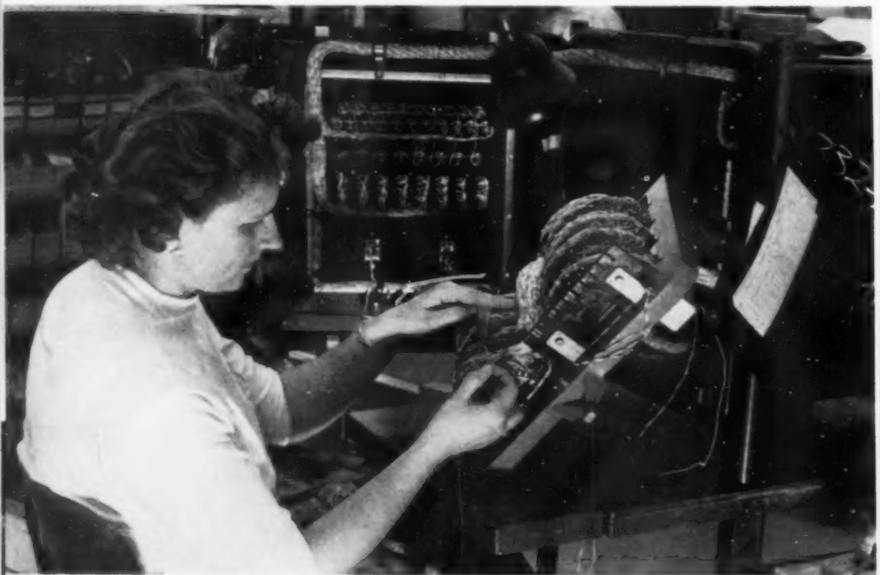


Fig. 4. Wiring a 160-point switching unit used for monitoring temperatures of industrial equipment, such as bearings in a power plant.

Fig. 5. Calibrating and testing electronic controllers. Instruments must perform satisfactorily for 24 hours under test conditions before they are shipped.

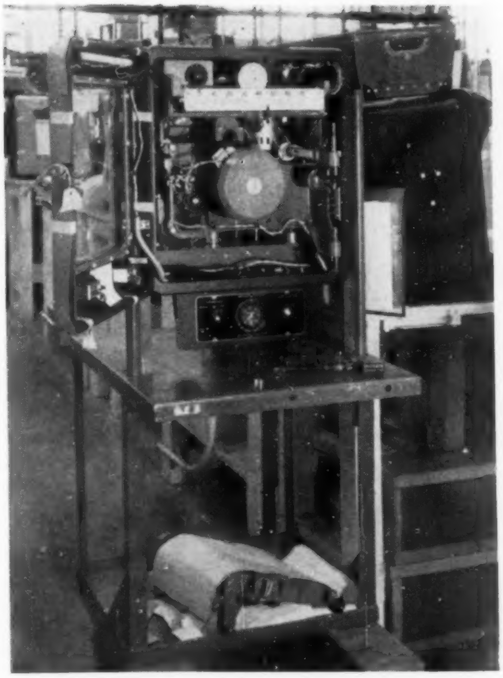


Fig. 6. Electronic controllers are mounted on trucks for easy conveyance between production operations. Instruments remain mounted from beginning of assembly to final boxing for shipment.

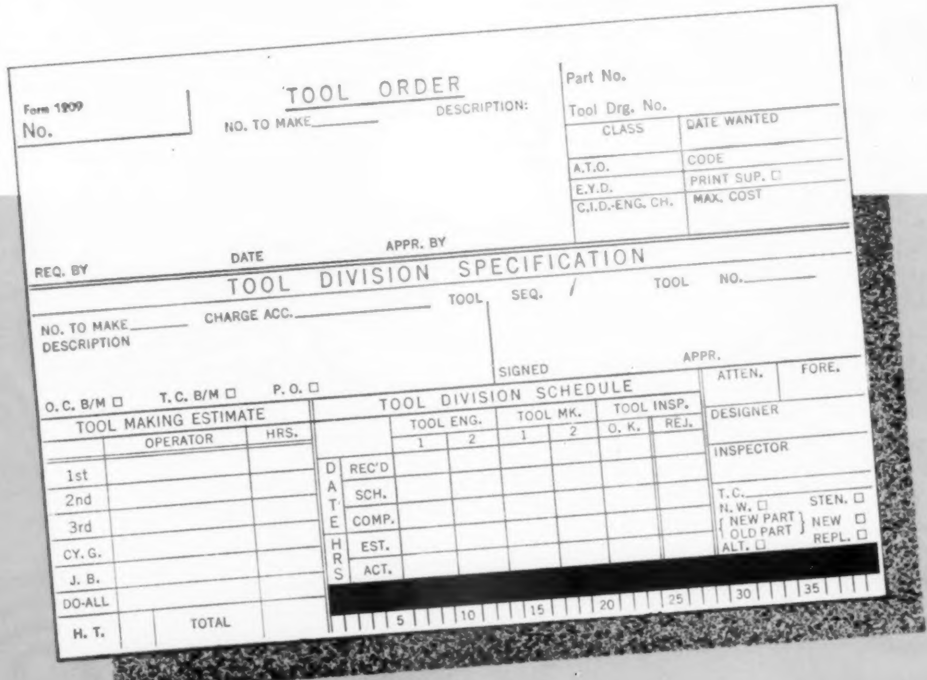
decide on tools to be used. Tool engineers then make estimates of design and fabrication time and set up a schedule for the tool. All scheduling is recorded on the tool order form and on a master tally board.

A tool standardization program has been instituted to provide an up-to-date record of all tools and machines. Dimensions and capacities are listed for all machine tools in the plant. Tool designs are standardized in catalogs by means of formulas and general drawings. Each new tool is designed in accordance with specifications of the formulas and drawings, and dimensions are recorded in the catalogs. A quick check will reveal what tools are available in stock for a specific job. For construction of standardized tools, a catalog number with pertinent dimensions establishes a tool design and saves time otherwise consumed in drawing.

Manufacturing Methods

Tool design ingenuity is encouraged and freedom of expression given to tool designers in developing new tools. An example of this is the design of an automatic machine for making thermocouple terminal blocks, *Figs.* 8, 9, and 10. The machine was designed and built by Leeds and Northrup engineers and toolmakers, using mainly standard components. The machine drills and countersinks five holes, taps two holes, inserts two stainless steel screws in these two holes, and deburrs and cuts the parts off the

Fig. 7. One form is used for tool orders and provides all information for scheduling and production of a tool.



Form 1909
No.
TOOL ORDER
NO. TO MAKE
DESCRIPTION:
Part No.
Tool Drg. No.
CLASS
DATE WANTED
A.T.O.
CODE
E.Y.D.
PRINT SUP. □
C.I.D.-ENG. CH.
MAX. COST
REQ. BY
DATE
APPR. BY
TOOL DIVISION SPECIFICATION
TOOL SEQ. /
TOOL NO.
NO. TO MAKE
CHARGE ACC.
DESCRIPTION
SIGNED
APPR.
ATTEN.
FORE.
O. C. B/M □ T. C. B/M □ P. O. □
DESIGNER
INSPECTOR

TOOL MAKING ESTIMATE	OPERATOR	HRS.
1st		
2nd		
3rd		
CY. G.		
J. B.		
DO-ALL		
H. T.	TOTAL	

TOOL DIVISION SCHEDULE		TOOL ENG. 1	TOOL ENG. 2	TOOL MK. 1	TOOL MK. 2	TOOL INSP. O. K.	TOOL INSP. REJ.
DATE	REC'D						
	SCH.						
	COMP.						
HRS	EST.						
	ACT.						

T.C.
N. W. □
NEW PART
OLD PART
ALT. □
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5 10 15 20 25 30 35

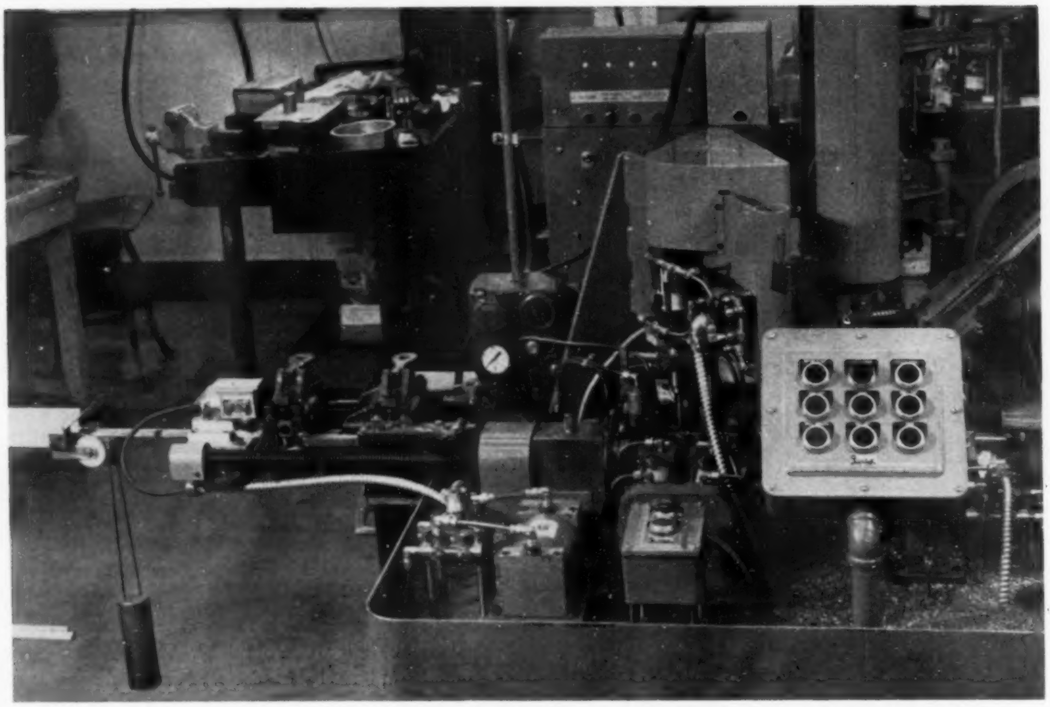


Fig. 8. Multistation automatic machines developed for manufacturing thermocouple terminal blocks.

stock, producing a finished part.

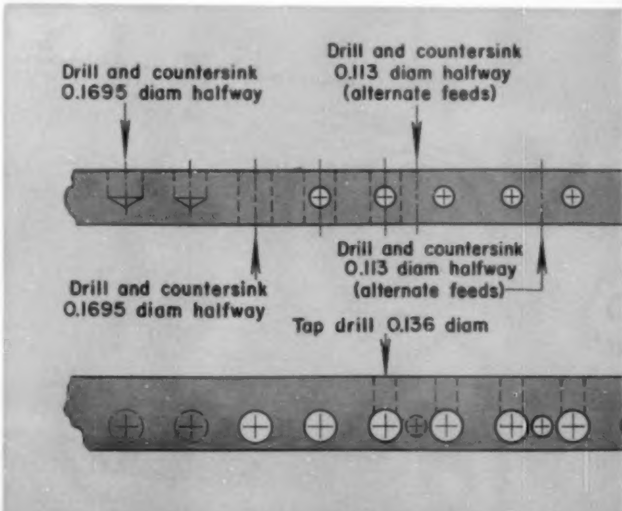
The previous manufacturing method was milling, tumbling to remove burrs and jig drilling. Attempts at forming the parts by stamping failed to produce acceptable results.

The machine design is based on the progressive die principle, *Fig.* 11. Operations are performed simultaneously and then the stock is advanced to the next station. The through holes are half drilled and countersunk from each side to eliminate burrs. After each drilling operation, the holes are probed to check position and size. A photocell checks the lower 1/8 inch of the tap to make sure it is not broken. By checking the tap in this manner, the threads are indirectly checked. If any holes are not properly located or are out of position, or the tap is broken off, the machine stops and the malfunction is indicated by lights on a control panel.

All longitudinal dimensions are multiples of 3/8 inch. A roll type feed unit moves the rectangular bar stock slightly less than 3/8 inch each cycle. After the first hole is drilled through, a bullet-nose shot pin checks the hole for size and repositions the stock at the exact 3/8-inch increment.

A major problem in designing the machine to produce a finished part, was eliminating the burr produced at cutoff. This was solved by broaching a V-groove on all four sides of the bar at the cutoff point. The groove is wide enough to accommodate the kerf of the cutoff saw and leave a small burr-free chamfer on the edges of the block.

The operations of drilling the large side holes, drilling and tapping the vertical holes and inserting the screws take place every cycle. The small side-hole drilling and cutoff operations are performed every other cycle since the parts are 3/4 inch long.



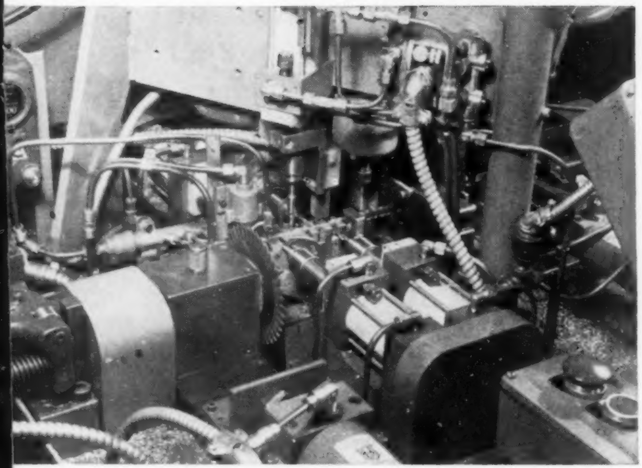


Fig. 9. Close-up of terminal block maker showing drilling and tapping operations on rectangular stock.

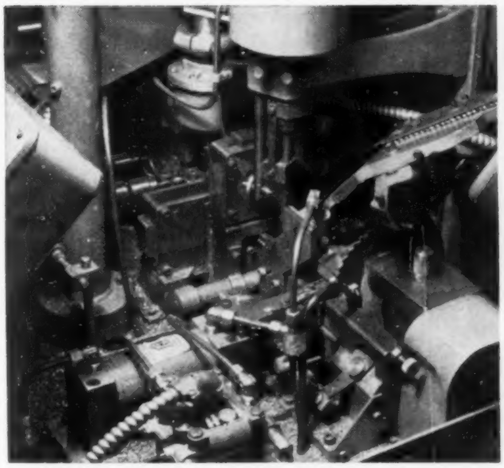


Fig. 10. Close-up of terminal block maker showing broaches, screw inserter and final cutoff saw.

or double the $\frac{3}{8}$-inch increment.

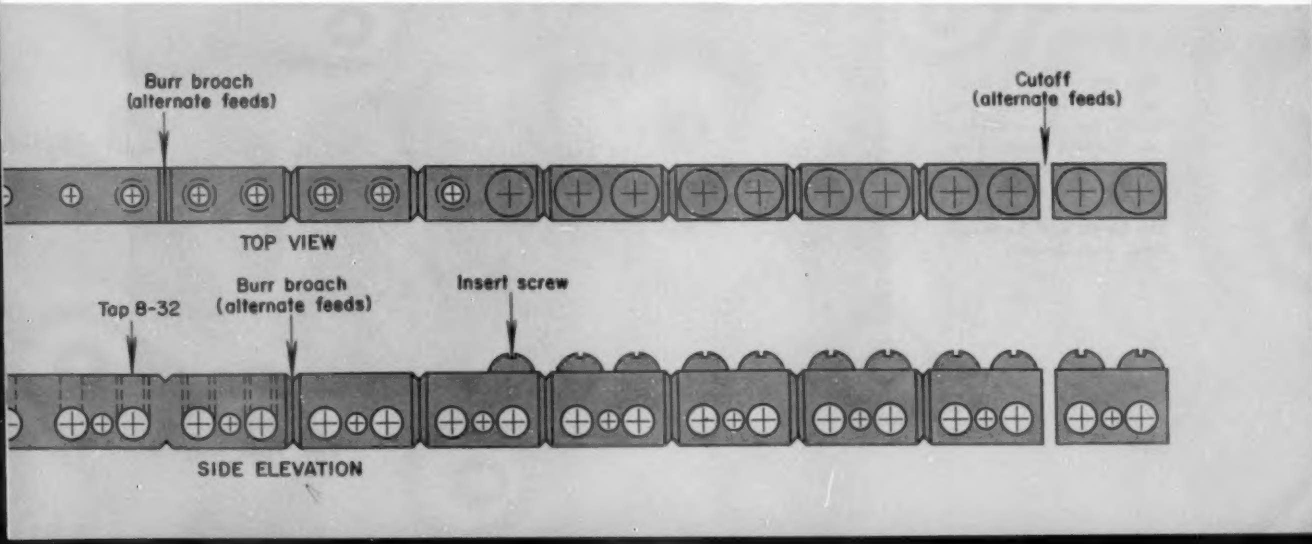
As each new piece of stock is fed into the machine, the operator trims off excess from the bar in process so that no part or half pieces will be made. No trimming is required on the lead end of the incoming bar since this is finished at the cutoff station.

A "gold brick," as the terminal blocks are called, comes out of the machine every five seconds. Chips and shavings are separated from the finished parts by dropping the blocks through a screen chute inside the machine base.

Another small-lot production problem was solved by constructing a special multispindle drilling machine, *Fig.* 12. Employing six spindles, the machine drills and taps two holes on a cylindrical piece with an 11-second cycle. The spindles are arranged 30 deg apart and parts are indexed 30 deg for each operation. One set of three spindles may be moved through an angle of 30 deg, locating the holes 90 deg or 120 deg apart as required. The inside diameter of the cylinder is broached to remove burrs. By changing broaches and drill sizes, many different small parts, such as gears, hubs, collars, sleeves, bushings and various subassemblies, can be processed.

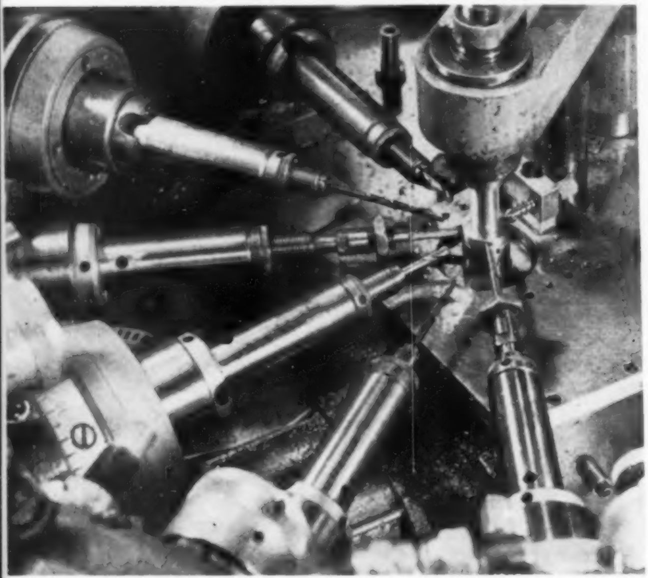
Another machine of interest designed and built by Leeds and Northrup tool engineers is an automatic drilling and reaming machine, *Fig.* 13. Although not as flexible as the multispindle drilling machine, it typifies the ingenuity of Leeds and Northrup tool engineers and craftsmanship of their toolmakers. This machine, also constructed of standard components, processes two sizes of parts. The machine

Fig. 11. Using a progressive die technique, rectangular bar stock is processed to produce finished burr-free parts.



drills two holes into a worm gear and reams the ID. A quick change slide adjusts for different sizes.

Many types and kinds of tools, such as scale makers, have to be constructed to suit specific needs. Much of the test gear for checking instruments and controls is not available commercially and must be devised and constructed to suit specific needs. Leeds and Northrup uses many of their own standard products in the North Wales plant. Naturally, some are used for testing and inspection. In addition, they can apply "homemade" control instruments to such operations as plant drying ovens, combustion equipment, heat-treat equipment and chemical metal treatment systems. In fact, all their heat-treat furnaces are their own products, being a standard item.



Employee Training

Realizing that productivity and usefulness of employees increase with added knowledge and education, the company has instituted various programs to aid employees in improving their own skills and therefore opportunities. For new employees, a training program extending over one year has been established. Instruction in various phases of operation is provided by the company staff.

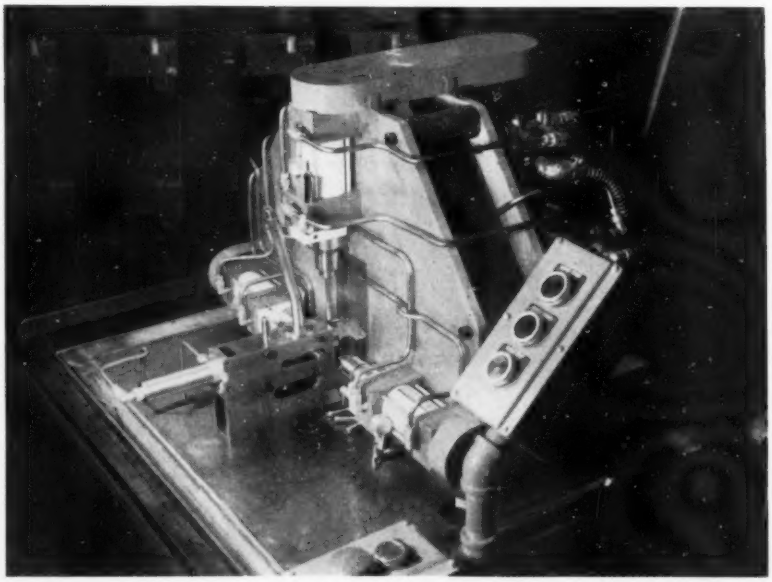
Instructional counseling sessions and seminars are provided for personnel on the management level. A major portion of fees for courses taken in line with work and satisfactorily completed at local institutions of learning is returned to the employee.

Production foremen are rotated to a new job every six months. It has been found that this system stimulates fresh ideas and promotes healthy competitive spirit. This program has been successful enough to warrant consideration of a similar plan for general foremen.

The problems of growth and expansion confront every business organization. Leeds and Northrup has recognized and solved these problems in a fashion designed to help close the gap with the future and enhance the productivity of American industry.

Fig. 12. (above) Six-spindle drilling and tapping machine constructed of standard components can process many different parts.

Fig. 13. (right) Drilling and reaming machine for processing small worm gears. Constructed using standard components, the machine was developed by the Leeds and Northrup tool department.



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aste NEWS

This is YOUR ticket to a well spent week

The stage has been set for ASTE's answer to P. T. Barnum's "greatest show on earth." The simultaneous opening May 1 of the Society's 26th Annual Convention and its 12th and most elaborate Tool Show will draw some 40,000 manufacturing men to the Philadelphia area to spend what may well be, for them, the most worth-while week in 1958.

The panorama of machines, processes and equipment—everything that might conceivably be needed in the highly specialized science of production engineering—plus the trend-setting technical sessions and informative tours of local industry that go hand in hand with the Tool Show, will be well worth their weight in admission tickets.

Taking their cue from the tempo of the times, convention planners have bent all their efforts to introduce new ideas, new techniques, and new approaches to today's most pressing problem, that of "Tooling for Competition."

Ideas Abound in Tool Showcase

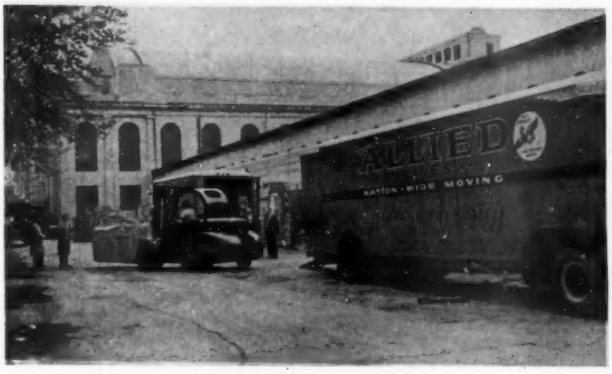
While the technical papers, over 130 in all, will present a rather complete short course in all phases of the manufacturing arts, just browsing through the miles of aisles will prove to be an education in itself. Displays of everything from cranes to clamps, and fans to furnaces—techniques ranging from ultrasonic cleaning to an unusual British-developed precision casting process—simple hand tools and complex electronic indexing equipment—twenty-seven-ton mechanical monsters and tiny diamond dust particles—these and thousands of other display items will stimulate imagination, spark fresh thinking, and help solve problems. Both for now and for the future, the trek to the Tool Show will be truly a trip to a stockpile of ideas.

Convention week fare does not stop at machinery exhibits and lectures. It also offers the opportunity to see competitive tooling "in action," in the thirty planned tours of industrial plants located in the Trenton-Delaware area.

"From soup to nuts" is not an inept description of the range of products being manufactured in these plants. Among those opening their doors to ASTE visitors is the Campbell Soup Co., which will escort several groups through its famed Camden, N. J., kitchens, while Standard Pressed Steel Co.'s battery of automatic screw machines may oblige by turning out nuts by the carload. Its Jenkintown plant not only houses precision threaded fastener equipment, but in its recently expanded Hallowell Division, boasts one of the most modern pressed steel fabrication facilities in the country.

Grinding wheels at Simonds Abrasive, magazines at Curtis Publishing Co. and Cuneo Eastern Press, locks and materials handling equipment at Yale & Towne—auto chassis and railroad cars, sheet steel and electronic computers—these products, and many more, can be viewed in process of manufacture by those who get their plant tour bids in early.

To get the most from the seven actual days of the Convention (Sunday, May 4, has been set aside as Atlantic City Day, with no other events scheduled), those planning to attend would do well to



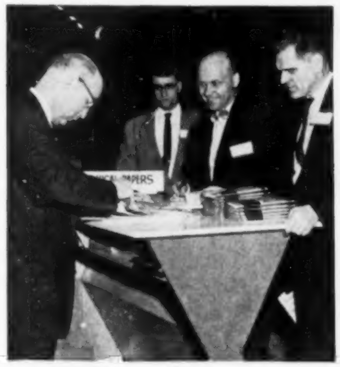
By truck and by train they come, in the days before the show. It takes a lot of machines to make a machine tool show like this.

Unloading and placing, painting, building, wiring—armies of men . . .

Set the stage for opening day of the "big show." Lighting is adjusted, signs checked and working models tested one last time.

The rush is on. Shuttle buses discharge their first eager loads . . .

Which jostle their way to the registration desks to pick up that all-important ticket, entitling them to a most memorable week.



Program Director Fletcher plans for an outstanding technical program.

United States Steel's Fairless Works, on the plant tour agenda, nestles in a bend of the Delaware river.

scan the convention calendar starting on page 150 of this issue, and make a check list of the sessions, tours and special events that promise to be most interesting or valuable to them.

Advance reservations for certain events, including special luncheon and banquet functions, are a bit of insurance against disappointment. They can be made weeks in advance by filling in the yellow reservation form that all members received with their convention program around the first of March.

Planning for Philadelphia should include planning for fun as well as for business. No one should miss the opportunity to spend a day on the Boardwalk and beaches of Atlantic City. In response to an invitation by that city's mayor, the Honorable Joseph Altman, the Philadelphia host committee has planned a trip to this "world's playground," arranging for bus transportation and the use of the Ambassador Hotel's facilities, including heated salt-water pool, for those that wish. A social hour and a dinner with dancing and entertainment, at the Ambassador, round out the day's program.

Banquet Bonus

Two banquets are among other items on the pleasure agenda. The Honor Awards dinner, at which six awards of national significance are presented to men outstanding in the scientific, research, and educational fields allied to tool engineering, will be held Monday evening, May 5, in the Crystal Ballroom of the Benjamin Franklin Hotel.

Crowning event of the week will combine the solemnity of installation night with the quick wit and glib tongue of William Hazlett Upson, hilarious lecture-hall favorite chosen to speak at the Annual Installation Banquet on Wednesday. Additional attractions lined up for this affair include a social hour in the Grand Ballroom of the Sheraton Hotel, with entertainment by the Mary Catherine Trio.

From the curtain-raising Philadelphia Day Luncheon May 1 to the motion for adjournment at the Annual Meeting of the Board on May 8, the first week in May promises indeed to be a week well-spent.

NBC to salute ASTE

A nationwide radio tribute to the tool industry will help set the stage for ASTE's biggest show.

Alex Dreier, the well-known commentator, will salute tool engineering on his program, "America on the Go," over NBC-Monitor at 6:05 p.m. Sunday, April 27. His 10-minute "color" coverage of America's most characteristic science will tie in with the Society's Convention and Tool Show opening in Philadelphia the following Thursday.

A tape recording of the network program will be supplied to the ASTE by Mr. Dreier's sponsor, North American Van Lines, for possible replay during the May 1-8 Convention.

Mr. Dreier's script will dramatize the contributions of the tool engineer to the American way of life, and the romance inherent in tool engineering's rise from the status of a smith's art to that of a complex science.

NBC expects two million persons over the country will hear the program. The network rates the Dreier "salutes," weekly tributes to geographical areas or to fields of activity representing "America on the Go," as among its greatest mail-pullers.

MAKE MINUTES COUNT at convention

With a record-smashing attendance expected at a tool show having some 500 exhibitors, over a hundred technical papers, and thirty plant tours, a bit of advance planning will help you make every minute count, without wasted time and frazzled nerves also attendant.

Travel plans and hotel accommodations should of course be confirmed as soon as possible. If you haven't already done so, send your hotel room requests to: ASTE Housing Bureau, Philadelphia Convention and Visitors' Bureau. Penn Square Building, Philadelphia, Pa.

Since upon your arrival in the "convention city" you may find a technical session at a hotel the first thing scheduled on your personal agenda, you can register at one of two downtown hotels, rather than at the Convention Center, where registration will be conducted during the hours of the Show. The Betsy Ross Room at the Benjamin Franklin and the Hall of Flags at the Sheraton will be used as registration areas from 9 a.m. to 8 p.m. on Thursday, Friday and Saturday. During the second week of the Convention, hotel registration will also be held on Sunday from 2 to 9 p.m., on Monday and Tuesday from 9 a.m. to 8 p.m., and on Wednesday from 9 a.m. to 5 p.m.

To traverse the distance between hotels and the Convention Center, frequent shuttle bus service will be operated during show hours. Pickup points at the Benjamin Franklin, Drake, Bellevue-Stratford and Sheraton hotels are also accessible to the Barclay, Warwick, St. James, John Bartram and the Sylvania.

If you plan to participate in the tours of manufacturing plants in the Philadelphia area, you will find buses waiting for you at the Benjamin Franklin for morning tours and at the Convention Center for afternoon tours. Termination points will be at the Convention Center for morning tours and back again at the Benjamin Franklin for afternoon tours.

If you have any questions about the Society's many services, national activities or scientific publications, stop in at the ASTE Center located in the exhibition area at the Tool Show. Here also ASTE supplies and literature, normally sold throughout the year to members and nonmembers, will be available for purchase.

Map your moves, don't try to cover too much ground in one day, and take advantage of the social, as well as the technical fare listed on the convention calendar, and you will find your stay in Philadelphia relaxing as well as rewarding.

Career Day planned for Philadelphia students

High school and college students in the Philadelphia area have been invited by ASTE to take a closer look at the profession of tool engineering. At a special Career Day program Thursday, May 8, the final day of the Convention, a quartet of men, recognized leaders in the fields of manufacturing and engineering education, will tell their youthful audience about careers in this fast-moving science.

The hour-long program will leave time for a preliminary inspection of the Tool Show before lunch, after which students and their hosts, the national education committee, can return for a more thorough tour.

The anticipated 1200 student guests will be split into two groups so that separate programs can be more closely tailored to the differing interests at the high school and college levels.

The high school group's program, chairmanned by Gilbert Seeley, ASTE education director, will have A. R. Spalding, head of freshman engineering at Purdue, as the keynote speaker, with Dwillard J. Davis, Ford Motor vice president of manufacturing, giving the main address. At the college session, Chairman Oliver S. Hulley, educational consultant for GE, will introduce keynoter Robert McKee, training director at R. K. LeBlond, followed by Past President Harry B. Osborn, Jr., technical director of Tocco Div., Ohio Crankshaft Co.

Leadership Conference is KEY to ASTE's future

Imposing new Sheraton Hotel is scene of leadership conference May 5-6. Buses will shuttle registrants between Sheraton sessions and various activities, such as the honor awards dinner, at the Ben Franklin Hotel.

PROBABLY the most far-reaching and ambitious undertaking of a crowded week in Philadelphia will be the two-day leadership conference, Monday and Tuesday, May 5-6. On its success hinges the immediate future of the ASTE; its participants will determine, in great measure, how dynamic or how static the Society becomes in the next two years.

Not a regimen of indoctrination—nor, on the other hand, simply an excuse for leader-level fraternizing—the conference is rather a short course in the gentle art of leadership. Its purpose, simply stated, is to impress upon the new chapter chairman the size of his job.

According to present resolution of the board of directors, the leadership conference will henceforth be an annual affair.

Besides the newly elected chapter chairmen (delegates), the conferees will consist of the faculty advisers of student chapters and optionally the new chapter first vice chairmen (alternate delegates). The leadership sessions, through the use of informal talks, dialogues, skits, "conference tables," and visual aids, will attempt to school the participants in the history and objectives of the ASTE; acquaint them with national policies and operations; provide insight into chapter operations; and inculcate sound principles of chapter leadership.

The sessions will be held at the Sheraton Hotel. Tentative features of the first-day agenda include a "gallery of portraits"; vignettes illustrating how the national organization can help the chapter and what the member gets from his membership; a slide film "trip to 10700 Puritan"; and helpful tips on management of a chapter.

Most of Tuesday will be devoted to "conference tables" on various phases of Society activities: membership; program; education and professional engineering; chapter management and finances; technical publications and standards; editorial, public relations, and chapter bulletins. Conferees will be divided into six maneuverable groups which will move from table to table at regular intervals during the day.

Capping the conference will be a playlet underlining principles of effective management and proper use of the executive committee.

The "faculty" of the sessions will consist of national officers, directors, committee chairmen and certain staff associates.

Training Won't Be 'Wasted'

The leadership conference idea is not new. It was tried, and proclaimed a success, in 1953; now it is being revived after a change in the Society's bylaws to provide that the national delegates will be the incoming chapter chairmen rather than those retiring from office. Thus the leadership training will not be "wasted," but will be received by men who will conduct chapter activities for the forthcoming year or, in the case of alternate delegates, for the next two years.

Certain expenses of the regular registrants—the chapter chairmen and the faculty advisers of student chapters—will be borne by the ASTE. No expenses of the optional registrants—the first vice chairmen—will be paid by the Society, unless the alternate delegate is serving as the delegate.

Portion of the House of Delegates — the chapters' representatives—shown during the 1956 Annual Meeting in Chicago. Twenty more chapters have been added since then.

Delegates' agenda:

Democracy in Action

Competing for attention with the 500-odd booths at the ASTE's Tool Show will be a perennially popular exhibit that might be labeled "Democracy in Action."

It's the theme of things during the Convention—from the first day to the last, from the Philadelphia Day Luncheon to the annual meeting of the ASTE board of directors—as much so as is the official theme, "Tooling for Competition."

The big day of the democratic show, culminating for many aspirants months of expectancy and hours in smoke-filled rooms, will be Wednesday, May 7—election day.

At 9 a.m. the national delegates (the newly elected chairmen of the Society's 147 chapters) will convene in the Pennsylvania Room of the spanking new Sheraton Hotel. And President Harold E. Collins will officially open the 26th Annual Meeting.

With the delegates will be the alternates, the new first vice chairmen of the various chapters. All of them will be fresh from the two-day leadership conference described on the next page of this magazine—and all, theoretically at least, will be imbued with an eagerness to face up to the obligations and privileges of their new jobs.

Their first privilege will be to elect a chairman of the House of Delegates and House officers.

Then, with doors closed, the delegates' next order of business will be the election of the national board of directors for the 1958-59 term. These new directors will take office at the semi-annual meeting in October, 1958.

Voting will be by machine, the procedure first used at last year's meeting in Houston. The City of Philadelphia has promised the use of four voting machines free of charge, so that the only cost to the Society will be transportation of them to the Sheraton. As a further courtesy, the city has offered to provide maintenance crews for the balloting equipment.

The machines will be so adjusted that no one voter can cast his ballot for more than 14 candidates for directorships.

After the delegates' luncheon in the Independence and Constitution rooms of the Sheraton, the incumbent board of directors will meet at 3 p.m. to elect the national officers for 1958-59, who will be installed at the banquet that night.

Adjournment of the annual meeting's electoral functions will be at 5 p.m.

On the last day of the Convention, the current board of directors will gather once more, to pass on the annual reports of the various committees and to transact the business of the Society.

All members of the ASTE are welcome to attend this meeting, from 9 a.m. to 5 p.m. in the Sheraton's Constitution Room, and watch their governing board in action.

Another highlight of Annual Meeting activities, and one which truly is an outgrowth of the democratic way of life, is the second annual Eli Whitney memorial lecture-luncheon, at 12:30 p.m. Tuesday, May 6, in the Pennsylvania Room of the Sheraton. Dwillard J. Davis, vice president, manufacturing, Ford Motor Co., will speak on "Planning for Profit."

The kickoff for the Society's busiest week, the Philadelphia Day luncheon at 12:30 p.m. Thursday, May 1, in the Sheraton's Grand Ballroom, will be a salute to area industry. The welcome address will be given by Mayor Richardson Dilworth. Toastmaster Edward H. Wheeler, host chapter committee chairman, will present the speaker, H. Thomas Hallowell, president, Standard Pressed Steel Co.

Look for the FILLIP

Walt Whitman, who lived across the Delaware River, said "a great city is that which has the greatest men. . . ." Pre-eminent in Philadelphia is Ben Franklin, solid citizen of the past and present.

THE convention is a way of life in America, and especially so in Philadelphia, the most American of cities. William Penn's "holy experiment"— his "greene countrie towne"—has probably played host to visiting firemen of every description more often and more graciously than any other city.

Despite its eccentricities, its highfalutin airs and its highly polluted rivers, its blue bloods and blue laws, its insistence on calling blocks "squares," its dank catacombs under its monstrous City Hall—and yes, despite its scrapple—Philadelphia retains its power to charm.

* * *

THERE'S an old story (but not nearly so old as old Philadelphia) about Edward VII, while Prince of Wales, who said, after visiting the stolid metropolis:

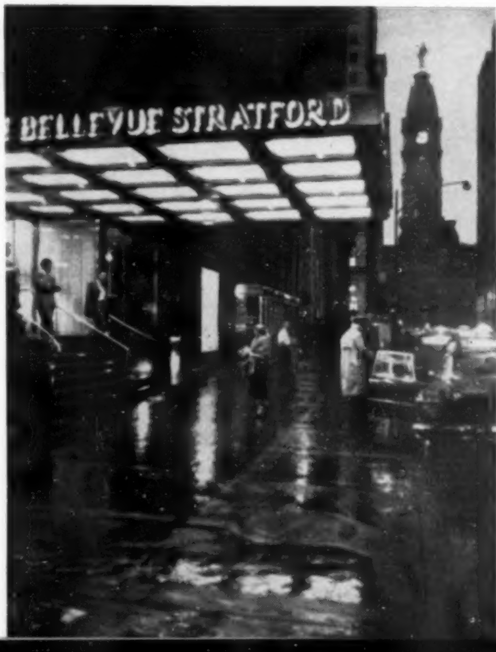
"I met a very large and interesting family named Scrapple, and I discovered a rather delicious native food they call biddle."

Suffice it to say about scrapple—the breakfast repast that sounds like a word game and indeed, to many, tastes a little like one—that enough has been said already. It long has been something of a national controversy: Philadelphians on one side of the table, and the rest of the nation on the other.

As for the Biddles, and the Cadwaladers, the Drinkers, the Ingersolls, the Morrises, and a definite number of other families, they are a mellow part of the patina of the city. It has been said that the texture of Philadelphia is so thick that whenever you touch anything, you touch something interesting. True. But for most tool engineers and others born out of the purple, some of it is untouchable, like the Biddles; some of it is untouchable for fastidious reasons, like scrapple. . . .

There's still plenty left, however, to touch the soul of the conventiongoer. For greater Philadelphia

A rainy evening, a storied hotel, and a shrouded City Hall set mood in Philadelphia.



in Philadelphia

Benjamin Franklin Parkway stretches before a contemplative statue.

is not simply an amalgamation of three million people, nor just an aggregation of stones and mortar. Rather it's the unique home of three million Philadelphians (the perceptive Irish novelist Sean O'Faolain recently said, "The nicest thing about Philadelphians is that they are really quite like Americans"), and its piles of stones and mortar are quite likely to be remembrance rocks.

* * *

TIME magazine says, "Philadelphia is up to its lorgnette in change." The Chamber of Commerce press releases say, "Staid old Philadelphia is long gone."

Don't believe them.

It's billion-dollar rebuilding program, stretching from Society Hill out to Germantown, won't really change things. A 14-acre Penn Center is going up; the infamous, pigeon-scarred Broad Street Station with its labyrinthian underground is gone. A new $50 million business center is being staked out as bulldozers smash down a three-block strip in the shadow of City Hall. One oversized square of buildings facing Independence Hall has been wiped out, clearing the way for a multimillion dollar state and city landscaping project, called the Independence Hall Mall. East of the Liberty Bell shrine, the Federal Government is buying up another three-block section chock-full of original Revolutionary landmarks; all of the post-Revolution construction will be cleared out and the area will become just as it was in 1776. The word "restoration" is verboten on this project, however, because all the buildings that were the haunts of Washington, Franklin, Hancock, et al., are the *originals* themselves.

"New" is the password from the past to the future. New city charter. New administration. New downtown shops, banks, hotels; new expressways, new steel, new stones, new concrete, new this and new that. . . .

What is left will be old Philadelphia, with a fillip. Arsenic and old lace, cloaked in the latest chemise.

* * *

ITS street names will still be fragrant—Pine, Spruce, Locust, Walnut, Chestnut, Vine, Cherry, Poplar, Spring Garden, Fairmount, Nectarine, Cypress, Buttonwood.

Wherever fine old houses with marble front steps are left standing, maids will still come out of an early morning and scrub the steps clean in a rite that reminds the visitor of Lady Macbeth washing her hands.

Many streets and remarkable alleys will continue to be dirty and cluttered, and when the wind blows will continue to provide much practice for the city's opticians. Climate will continue to be a boon for nose and throat specialists, who have made Philadelphia internationally known in that branch of medical research.

On Sundays, the majority of visitors in the city will have taken trains to New York or buses to the

It's AGE before BEAUTY

Elfreth's Alley, with its cobblestones and haphazard brickwork, offers a narrow vista of old Philadelphia.

Jersey shore, or cabs to Camden, where life goes on as usual.

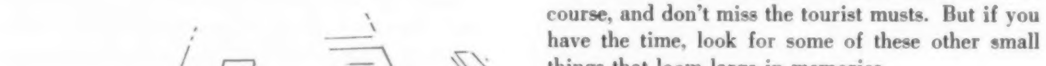
Hedges and culture will continue to flourish in the country's most beautiful suburbs, in the Main Line settlements of Bryn Mawr, Haverford, Radnor, Narbeth, Wynnewood; in Drexel Hill, Lansdowne, Darby, Chestnut Hill.

U. S. Steel's $400 million Fairless Works, the biggest new plant, will soon be running at capacity, and tourists will gape at it and at the Budd plant producing streamlined railroad cars, at the Baldwin locomotive works, the shipyards—but there will still be plants turning out false teeth and sombreros and Valentines and you name it.

* * *

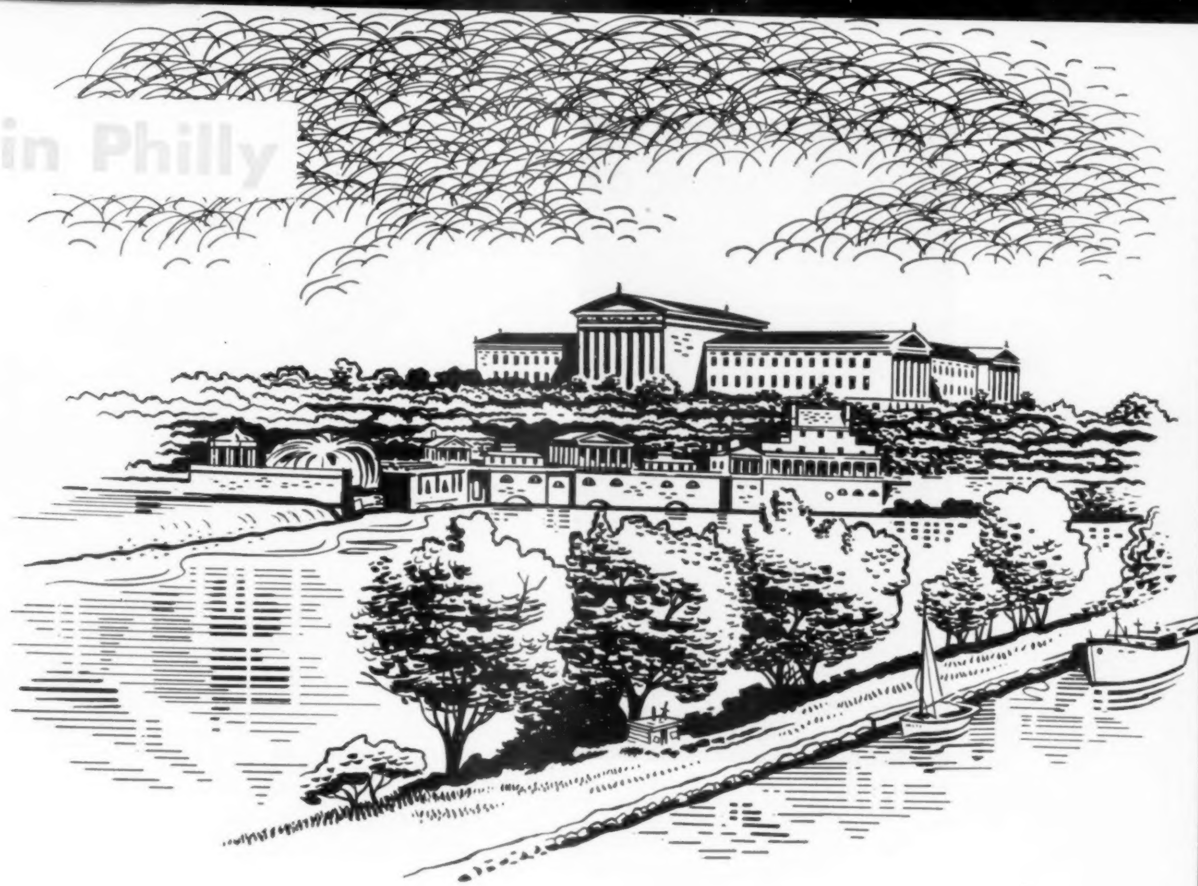
THE essential Philadelphia, in short, is not the industrial and commercial giant that sprawls far beyond the Schuylkill and for miles up and down the Delaware. Neither is the essential city, the unique city that all Americans cherish and that shall long endure, only the city where the Declaration of Independence and the Constitution were written, the city of Franklin with his books and his kites and lightning rods; but even more, it is the city of a thousand and one sights and sounds and smells that set it apart.

Don't miss the Tool Show and the Convention, of course, and don't miss the tourist musts. But if you have the time, look for some of these other small things that loom large in memories.

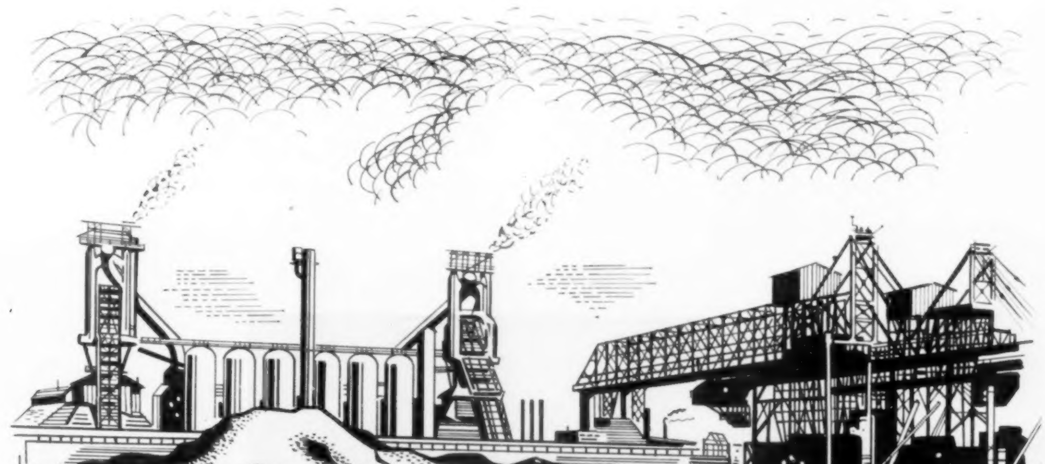


Independence Hall Mall, part of a $100 million program to beautify the nation's greatest shrines, runs north from Chestnut Street to Franklin Square approach to Ben Franklin Bridge across the Delaware.

in Philly



Imposing Museum of Art is seen from West River Drive.



Blast furnaces and ore yard are seen from across the slip at U. S. Steel's new Fairless Works. Cargo of ore is being unloaded from freighter.

Convention Calendar

MAY 1 thursday

Tooling for Aircraft Production I

3 p.m. Ballroom
Convention Center

(New supersonic designing concepts in the aircraft industry have imposed unprecedented demands upon existing tooling facilities. How some of these problems are overcome is illustrated in this session.)

"Magnesium in Aircraft Tooling" (Paper #46), by Karl F. Melde, tool engineer, Boeing Airplane Co.

"A Tool Engineer's Approach to the B-58 Weapon System" (Paper #47), by Ralph A. Fuhrer, chief manufacturing engineer, Convair Div., General Dynamics Corp.

Chairman: Joseph J. McDevitt, chief industrial engineer, C. H. Wheeler Mfg. Co.

Tooling for Aircraft Production II

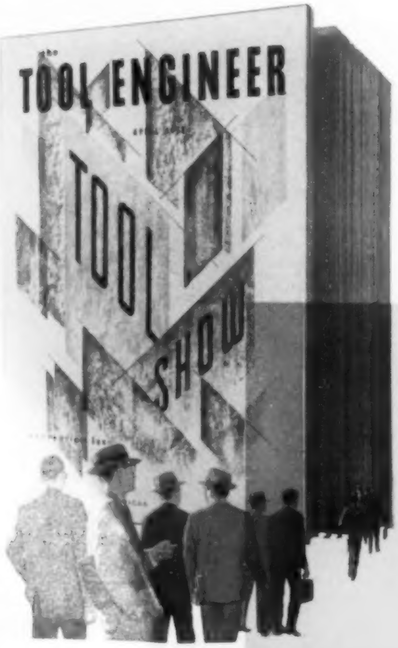
8 p.m. North Garden
Bellevue-Stratford

(How cold roll forming from thick to thin can cut costs—labor-saving operations—how to cut down the plant accident rate—a new approach to safety engineering.)

"Weight Savings in the Manufacture of Aircraft Engine and Missile Parts by Cold Roll Forming from Thick to Thin Material" (Paper #51), by Arthur A. Merry, chief, advanced tool engineering; and John G. Campbell, project engineer, Pratt & Whitney Div. of United Aircraft Corp.

"Safety Engineering as a Function of Human Engineering" (Paper #52), by Max A. Pape, senior research engineer, Missile Systems Div., Lockheed Aircraft Corp.; R. W. Faubion, human engineering specialist, North American Aviation; and Nikki Kaye, Kaye-Pape Associates.

Chairman: Edwin V. C. Kapp, Glenn L. Martin Co.



Philadelphia Day Luncheon

A Salute to Philadelphia-Area Industry

12:30 p.m. **Grand Ballroom** **Sheraton Hotel**

Welcome—The Honorable Richardson Dilworth, Mayor of Philadelphia

Toastmaster—Edward H. Wheeler, chairman, Philadelphia Host Chapter Committee.

Speaker—H. Thomas Hallowell, president, Standard Pressed Steel.

(Tickets $4.50)

MAY 2 friday

Plastic Tooling

9:30 a.m. Room 200 Convention Center

(How application of new plastic compounds can eliminate expensive production operations—the high versatility of plastics and metal-plastic fibers—how the tool engineer can use shell molding to cut costs.)

"For Tools and Dies—New Epoxy-Fiber Compositions" (Paper #55), by A. P. Mazzucchelli, assistant director of development laboratories, Bakelite Co., Union Carbide Corp.

"Our Experience in the Use of Plastic for Making of Duplicate Die Models, Engineering Checking Fixtures and Prototype Tools" (Paper #56), by A. E. Vallier, executive engineer, Body Fabricating Metals Stamping Group; and H. L. Wyatt, manager, Die Model and Template Dept., Ford Motor Co.

"Shell Molding and Tool Engineering" (Paper #57), by Otto W. Winter, manager, Shell Molding Div., Beardsley and Piper, Div. of Pettibone Mulliken Corp.

Chairman: Donald B. Spatz, York-Shipley, Inc.

Steel—Forgings and Extrusions

9:45 a.m. Ballroom Convention Center

(Benefits and advantages of improved steel forgings—application of Sejournet-processed steel—tips on proper forging. Tolerances, design limitations, and restrictions associated witth hot-extruded, cold-drawn steel.)

"Steel Forgings, Why and How" (Paper #63), by A. O. Schaefer, president, Pencoyd Steel & Forge Corp.

"Design Features and Cost Benefits of Hot Extruded and Cold Drawn Steel" (Paper #62), by R. L. Hugo, senior sales engineer, Jones & Laughlin Steel Corp.

Chairman: Robert L. Smith, chief tool engineer, Carbide Die Mfg. and Tool Crib Service, Standard Pressed Steel Co.

Nuclear Engineering

2 p.m. Ballroom Convention Center

(Some of the unique problems encountered in nuclear engineering—safety, plant layout, standardization, motivations for development.)

"Standardization in the Nuclear Industry" (Paper #64), by Dr. Henry H. Hausner, vice president, Nuclear Engineering, Penn-Texas Corp.

"Unique Aspects of Nuclear Component Manufacture" (Paper #65), by H. C. Amtsberg, engineering manager, Atomic Fuel Dept., Westinghouse Electric Corp.

Chairman: James E. McAleer, chief inspector, Nuclear Products, Erco Div., ACF, Inc.

Cutting Tools

2:30 p.m. Room 200 Convention Center

(New developments in carbide tooling—how to apply a single standardized procedure developed for rating toughness of tool steel.)

"Tool Steel Toughness—Rated by a New Method of Measurement" (Paper #66), by Gary Steven, acting supervisor, Central Research Laboratory; A. E. Nehrenberg, manager, Product Research and V. D. Chandhok, staff engineer, Tool Steel Section, Crucible Steel Co. of America.

"Basic Developments in Carbide Tooling" (Paper #67), by W. L. Kennicott, vice president engineering, Kennametal, Inc.

Chairman: Donald Betts, supervisor, Product & Methods Engineering, Standard Pressed Steel Co.

Ceramic Tools

8 p.m. Burgundy Room Bellevue-Stratford

(Evaluations of new ceramic tool compositions—new data on recently performed experiments with high-velocity machining.)

"New Developments in High-Velocity Machining" (Paper #68), by Wallace B. Kennedy, chief, Experimental Machining Branch, Rodman Laboratory, Ordnance Corps, Watertown Arsenal.

"Characteristics and Experimental Performance of Certain New Ceramic Tool Compositions" (Paper #69), by A. G. King, research engineer; and W. M. Wheildon, senior engineer, Research & Development Dept., Norton Co.

Chairman: Charles R. Skord, manager, Quality Control, Standard Pressed Steel Co.

Tool Engineering Research I

8:15 p.m. Oak Room Bellevue-Stratford Hotel

(This session includes one of the few available reports on high-speed cuttting and machining of aluminum—also new information on production of gears and splines.)

"Role of Research and Development in Gear and Spline Production Equipment" (Paper #70), by Richard S. Hildreth, chief engineer, Michigan Tool Co.

"Research Report on High-Speed Circular Sawing of Aluminum Alloys" (Paper #71), by O. H. Nuss, research and development engineer, DeWalt Div., American Machine & Foundry Co.

Chairman: Humbert Di Paul, training coordinator, Standard Pressed Steel Co.

plant tours for friday

Tour #1—8:15 a.m. Leeds & Northrup Co. North Wales plant. Limit 50 visitors. Electronic controls. Tour of all operations, including toolmaking and inspection, heat treating, parts machining, finishing, mechanical assembly, calibrating, testing and materials handling.

Tour #2—8:45 a.m. Schramm, Inc. Limit 37 visitors. Air compressor units. Tour of machine shop, metal shop, welding, testing, and assembly departments.

Tour #3—9:15 a.m. Fischer & Porter Co. Limit 100 visitors. Tour of metalworking, glass-fabricating and ceramic operations in the manufacture of process control, proportioning and indicating instruments. Tour includes luncheon.

Tour #4—12:30 p.m. Minneapolis Honeywell Brown Instruments Div. Limit 25 visitors. Sensitive pressure gages, flow meters, voltage regulators and temperature controls. Visitors will see the machine shop, with a large group of automatic screw machines, and instrument assembly.

Tour #5—12:30 p.m. The Budd Co. Red Lion plant. Limit 50 visitors. Must be U.S. citizens. Assembly of stainless steel railway passenger cars from raw material to finished car; forming and assembly of automotive chassis frames and jet engine components; and production of automotive brake drums.

Tour #6—1 p.m. Curtis Publishing Co. Curtis Park plant. Limit 75 visitors. How 1,000,000 issues of the Saturday Evening Post are printed with 12 YY presses, each of which consumes 70 tons of paper per day.

MAY 3 saturday

General Tool Engineering I

9:45 a.m. South Garden Bellevue-Stratford

(Importance of ceramic tools in producing high-temperature plastic parts—recent developments in logic elements and design of electrical control sequencing.)

"Static Switching for the Mechanical Engineer" (Paper #73), by Arthur H. Wolfson, manager, Research & Development, Gage Div., Pratt & Whitney Inc.

"Vitrifiable Silicate Tooling for High-Temperature Plastics" (Paper #74), by J. D. Stillman, tool development technician, Manufacturing Development, Convair Div., General Dynamics Corp.

Chairman: Fred G. Holzhausen, field and service engineer, Lepel High Frequency Laboratories, Inc.

Metal-Cutting Research I

10 a.m. North Garden Bellevue-Stratford

(An evaluation of present knowledge of chip formation and related phenomena—distribution of stress on tool face—methods of calculating temperatures in the shear zone—application to specific problems.)

"Mechanism of Chip Formation in Metal-Cutting" (Paper #75). "Some Thermal and Physical Aspects of Metal-Cutting" (Paper #76). Both papers by Dr. Donald N. Gideon, experimental physicist; Dr. Ralph Simon, consultant; and Dr. Horace J. Grover, chief, Mechanical Engineering Dept., Applied Mechanics Div., Battelle Memorial Institute.

Chairman: Fred H. Glanding, University of Pennsylvania.

Surface Finishes

1:30 p.m. South Garden Bellevue-Stratford

(First technical paper on hard gear finishing process—improves tooth surface finish—corrects small heat treat errors—removes nicks and burrs—how to choose honing stones for specific finishes—main factors affecting finish.)

"Gear Tooth Honing—a New Approach to Improving Gear Surface Finish" (Paper #77), by B. F. Bregi, vice president, National Broach & Machine Co.

"Obtaining Specified Finishes by Honing" (Paper #78), by B. R. McConnell, Sr., honing engineer, Sunnen Products Co.

Chairman: LeRoy S. Paulsen, assistant general superintendent, Link-Belt Co.

Metal-Cutting Research II

2 p.m. North Garden Bellevue-Stratford

(Review of three of the factors determining success of metal-cutting operations—cutting fluids, metallurgical properties of the tool and of the workpiece.)

"Present Knowledge of Cutting Fluids" (Paper #79), by S. L. Cosgrove, principal chemist, Chemical Research; and Roy W. Greenlee, assistant consultant, Chemistry Dept., Battelle Memorial Institute.

"Influence of Metallurgical Properties on Metal-Cutting Operations" (Paper #80), by Francis W. Boulger, chief, Div. of Ferrous Metallurgy, Battelle Memorial Institute.

Chairman: George E. Smith, district manager, Kennametal, Inc.

General Tool Engineering II

8 p.m. South Garden Bellevue-Stratford

(Use of high-speed 150-horsepower lathe in machinability tests of ceramic tools—new methods of manufacturing hydraulic servo valves.)

"New Manufacturing Techniques for Hydraulic Servo Valves" (Paper #81), by Edgar M. Hakanson, manager, Machine Tool Div., Sheffield Corp.

"The Use of Ultrahigh-Speed 150-horsepower Lathe for Machinability Studies" (Paper #82), by H. J. Siekmann, manager, Applied Mechanics Engineering, Metallurgical Products Dept., General Electric Co.

Chairman: George L. Cummings, sales engineer, Machine Tools, W. E. Shipley Machinery Co.

Metal-Cutting Research Panel

8:30 p.m. Rose Garden Bellevue-Stratford

(Five papers and a panel discussion, in which the audience may participate in an assessment of the present fund of metal-cutting knowledge.)

Paper #83, by Prof. L. V. Colwell, Dept. of Production Engineering, College of Engineering, University of Michigan; E. L. Fowler, Research & Development Div., International Nickel Co., Inc.; R. E. McKee, training director, R. K. LeBlond Machine Tool Co.; Prof. Kenneth J. Trigger, Dept. of Mechanical Engineering, University of Illinois; and Norman Zlatin, partner, Metcut Research Associates.

Chairman: Francis W. Boulger, chief, Div. of Ferrous Metallurgy, Battelle Memorial Institute.

SUNDAY May 4

ATLANTIC CITY DAY

9 a.m. Buses will leave Bellevue-Stratford and Benjamin Franklin hotels.

11 a.m. Buses will arrive at the Ambassador Hotel in Atlantic City. Visitors can then explore the Boardwalk and beaches at their leisure. A heated salt-water swimming pool in the Ambassador will be available. Arrangements have also been made for golfers to use the links at the Atlantic City Country Club (usual green fees.)

4 p.m. Cocktail hour in the Venetian Room of the Ambassador Hotel. Entertainment, dancing, and music.

5 p.m. Dinner at the Ambassador.

7:30 p.m. Buses return to Philadelphia, arriving at point of departure at 9:30 p.m.

Total cost, including transportation, cocktail hour, and dinner—$10 per person.

MAY 5 monday

Numerical Control Symposium I

9:30 a.m. Ballroom Convention Center

"Numerical Control: Facts and Fallacies" (Paper #84), by T. W. Black, senior associate editor, THE TOOL ENGINEER magazine.

"Numerical Control" (Paper #85), by R. V. Benaglio, Research Laboratories Div., Bendix Aviation Corp.

Chairman: Emil Kitzman, general superintendent, Colmar Plant, Link-Belt Co.

Tool Engineering Research II

9:45 a.m. Room 300 Convention Center

(New formula for metal-cutting establishes direct relationship between chip compression, coefficient of friction and rake angle—tips on proper use of machine tool dynamometers.)

"A New Approach to Some Relationships in the Theory of Metal-Cutting" (Paper #86), by Dr. Max Kronenberg, consulting engineer.

"Machine Tool Dynamometers, Their Design and Application" (Paper #87), by Erik K. Henriksen, project manufacturing research engineer, Manufacturing Research & Development Dept., Convair Div., General Dynamics Corp.

Chairman: Howard W. Gross, dean of Spring Garden Institute.

General Tool Engineering III

10 a.m. Room 200 Convention Center

(Surface finishes—automatic size control on centerless grinders—results possible with electrodischarge machining.)

"Automatic Size Control for Centerless Grinders" (Paper #88), by Arthur Parnes, project engineer, Airborne Instruments Laboratory, Inc.

"The Significance of the Surface Finish Produced by Electrodischarge Machining" (Paper #89), by Charles H. Good, plant manager, Micrometrical Development Corp.

Chairman: Herbert W. Yeager, Jr., chief process and jig design engineer, The Budd Co.

Numerical Control Symposium II

1:30 p.m. Ballroom Convention Center

"Machine Tool as the Controlled Element" (Paper #90), by J. R. Ballinger, manager, Research Laboratories Div., Bendix Aviation Corp.

"Potential of Numerical Control in Manufacturing Operations" (Paper #91), by L. S. Peck, applications engineer, Autonetics Div., North American Aviation, Inc.

Chairman: Carl A. Bufflap, Jr., SKF Industries, Inc.

Diamond Tools I

2 p.m. Room 300 Convention Center

(Diamond cutting tools—importance of their proper orientation—application to single-point tools—consideration of two major factors: abrasion and fracture.)

"Oriented Diamonds in Connection with Single-Point Tool Applications" (Paper #92), by J. R. Speirs, chief engineer, American Coldset Corp.

"Proper Grain Orientation Improves Diamond Cutting Tool Life" (Paper #93), by Jan Taeyaerts, president, Precision Diamond Tool Co.

Chairman: Winfred O. Dick, production manager, Eddystone Div., Baldwin-Lima-Hamilton Corp.

Guided Missile Program

2:30 p.m. Fels Planetarium Franklin Institute

"A Production Engineer Looks at Missile Design" (Paper #94), by F. R. Swaney, general superintendent, Experimental Production, Missile Operations, Chrysler Corp.

"A Missile Designer Looks at Production," (Paper #95), by Emil A. H. Hellebrand, aeronautical research engineer, Structures & Mechanics Laboratory, Army Ballistic Missile Agency.

Chairman: J. B. Medaris, commanding general, Army Ballistic Missile Agency.

Leadership Conference

For Chapter Chairmen and First Vice Chairmen (delegates and alternate delegates), and Faculty Advisers of student chapters.

8 a.m. to 4:30 p.m. sessions, Sheraton Hotel

Honor Awards Dinner

Presentation of Six ASTE Awards
7:30 p.m., Crystal Ballroom, Benjamin Franklin Hotel.

(Tickets $7.)

plant tours for monday

Tour #7—8 a.m. U. S. Steel Corp., Fairless Works.
Limit 50 visitors. Tour of ore piers, docks for ocean liners, blast furnaces, rolling mills, the tinning process and the building where steel is pickled.

Tour #8—8:30 a.m. Standard Pressed Steel Co.
Jenkintown plant. Limit 100 visitors. Tour of heat-treating equipment, metallurgical testing laboratory, gage room, tool and die room and automatic plating line.

Tour #9—9:15 a.m. Philadelphia Navy Yard.
Limit 200 visitors. No cameras permitted. Tour of submarines, destroyer escorts, drydocks, and part of Navy's "mothball" fleet. Demonstration of on-board fire-fighting at damage control center, and visit to the naval air materiel center and the boiler and turbine laboratories.

Tour #10—11:30 a.m. Chrysler Corp.
Plymouth Div. Limit 50 visitors. Operations in 1½-million-square-feet plant—largest Plymouth assembly outside Michigan.

Tour #11—12:15 p.m. Campbell Soup Co.
Limit 40 visitors. Preparation of ingredients, blending and cooking of soups, the labeling of cans and their casing. Tour includes color movie, refreshments, and samples. (Considerable walking, not recommended for the elderly.)

Tour #12—1 p.m. Curtis Publishing Co.
Curtis Park plant. Limit 75 visitors. How 1,000,000 issues of the Saturday Evening Post are printed with 12 YY presses, each of which consumes 70 tons of paper each day.

MAY 6 tuesday

Numerical Control Symposium III

9:30 a.m. Ballroom
Convention Center

"Numerical Control for Templates and Dies" (Paper #96), by Dr. Darwin H. Bingham, Jr., supervisor, Numerical Control Programming Section, Giddings & Lewis Machine Tool Co.

"Production Experience on Numerically Controlled Machine Tools" (Paper #97), by F. Booth, Research Laboratories Div., Bendix Aviation Corp.

Chairman: Edward F. Miller, production superintendent, SKF Industries, Inc.

Metal Powder Parts Symposium I

9:30 a.m. South Garden
Bellevue-Stratford

(What are the advantages of metal powder parts? The economics? How can metal powder parts save money? This special symposium will give tips on the proper application of processing methods for metal powder parts, effects of powder friction on tool materials, importance of standard test methods, and information on the ever-increasing utility of powder metallurgy.)

"The Effects of Structural Part Design on Tooling for Sintered Metals Fabrication" (Paper #98), by Frank J. Demaine, associate engineer, Sintered Metal Laboratory, International Business Machines Corp.

"Process Selection and Economics" by Professor Gregory J. Comstock, Powder Metallurgy Laboratory, Stevens Institute of Technology. (Paper not printed.)

Chairman: Cecil L. Clark, field engineer, Jones & Lamson Machine Co.

Diamond Tools II

9:45 a.m. Room 300
Convention Center

(Oriented diamonds necessary for optimum performance—how the new oriented slab tool outwears single-point—results of both laboratory experiments and on-the-job testing.)

"Oriented Diamonds Give Maximum Performance in Formed Dressing Tools" (Paper #99), by Joseph Klipper, vice president and general manager, Clipper Diamond Tool Co., Inc.

"The Oriented Vector in Diamond Dressing Tools" (Paper #100), by Harold C. Miller, Chief research engineer, Super-Cut, Inc.

Chairman: James Harris, assistant man-

Tour #13—8:30 a.m. Standard Pressed Steel Co.
Jenkintown plant. Limit 100 visitors. Tour of heat-treating equipment, metallurgical testing laboratory, gage room, tool and die room and automatic plating line.

Tour #14—8:45 a.m. The Budd Co.
Hunting Park plant. Limit 50 visitors. Must be U.S. citizens. Production and assembly of automotive body components. The company's pattern shop produces its own dies, jigs and fixtures.

plant tours for tuesday

Tour #15—9:15 a.m. Philadelphia Navy Yard.
Limit 200 visitors. No cameras permitted. Tour of submarines, destroyer escorts, drydocks, and part of Navy's "mothball" fleet. Demonstrations of on-board firefighting at damage control center, and visit to the naval air materiel center and the boiler and turbine laboratories.

Tour #16—10 a.m. Simonds Abrasive Co.
Div. of Simonds Saw and Steel Co. Limit 37 visitors. Grinding wheels manufacture from crushing of crude abrasive through final inspection and shipping. One-thousand-ton, 4-station presses and automatic presses will be seen. Movie and luncheon included.

Tour #17—8 a.m. U. S. Steel Corp.
Fairless Works. Limit 50 visitors. Tour of ore piers, docks for ocean liners, blast furnaces, rolling mills, the tinning process and the building where steel is pickled.

Tour #18—12:30 p.m. Link-Belt Co.
Nicetown plant. Limit 40 visitors. Machining operations for mechanical power transmission equipment will be shown on this tour. Also heat-treating, production assembly lines and inspection.

Tour #19—1 p.m. I-T-E Circuit Breaker Co.
Special Products Div. Limit 100 visitors. Must be U.S. citizens. Radar components, analyzers and antenna systems. Also the manufacture of molded case circuit breakers, branch and feeder circuits.

ager, Tooling and Quality Control, Standard Pressed Steel Co.

New Drilling Techniques

10 a.m. Room 200
Convention Center

(Latest in drilling techniques: the self-centering spiral point, its laboratory results and shop evaluations—manual and automatic gun type carbide drills and reamers, their development and applications.)

"The Spiral Point Drill—A Self Centering Drill Point Geometry" (Paper #101), by Hans Ernst, research consultant; and W. A. Haggerty, research supervisor, Cincinnati Milling Machine Co.

"Production Drilling and Reaming of Precision Holes with Gun Type Tools" (Paper #102), by Herbert Gregg, chief engineer, Star Cutter Co.

Chairman: William Reber, chief tool engineer, Homelite Div., Textron, Inc.

Diamond Tools III

3 p.m. Room 300
Convention Center

(New pressureless method of setting oriented diamond tools prevents shifting—X-ray image intensifier tube offers simple method of obtaining rapid, accurate orientation.)

"A Rapid Method for Setting Oriented Diamonds in Tools" (Paper #103), by R. G. Weavind, director of research; C. J. Guykers and A. R. Roy, Crown Mines.

"The Orientation of Diamonds for Tools by Means of an X-ray Image Intensifier Tube" (Paper #104), by Dr. J. F. H. Custers, director of research, Diamond Research Laboratory, Crown Mines.

Chairman: Joseph L. Geist, Lester, Pa.

Metal Powder Parts Symposium II

3 p.m. South Garden
Bellevue-Stratford

"Presses for Powder Metallurgy" (Paper 105), by James J. Kux, vice president and general manager, Kux Machine Co.

"Briquetting Tools" (Paper #106), by Robert A. Koehler, metallurgist, Research Dept., Powder Metal Div.; and J. N. Smith, tool engineer in charge of powder metal tools, National Cash Register Co.

"Metal Powders and the Tool Engineer" (Paper #107), by William L. Batten, manager, Powder Metallurgy Dept., Vanadium Alloys Steel Co.

Chairman: George Foster, carbide application engineer, Standard Pressed Steel Co.

Numerical Control Symposium IV

3:15 p.m. Ballroom
Convention Center

"Contouring Control from Numerical Data" (Paper #108), by John W. Wilson, project engineer, Development Research Dept., Cincinnati Milling Machine Co.

"The Tool Engineer and Tape Preparation" (Paper #109), by H. H. Schatz, Research Laboratories Div., Bendix Aviation Corp.

Chairman: William C. Stewart, SKF Intries, Inc.

Numerical Control Symposium V

8 p.m. Constitution, Independence
Rooms, Sheraton

"Numerical Control—First Year Statistics" (Paper #110), by Bernard Gaiennie, adminstrator, Research & Development, Northrop Aircraft, Inc.

"Programming for Numerical Control" (Paper #111), by Carl B. Perry, supervisor, Plant Engineering, Douglas Aircraft Co., Inc.

Chairman: Frank B. Higgins, production manager, Dept of Production Control, C. H. Wheeler Mfg. Co.

European Tool Engineering

8:30 p.m. Pennsylvania Room
Sheraton

(Use of radioisotopes to study tool wear—significance of relationship between fine machined surfaces, tool life and machining cost studies—application of cost high-speed steel tools—useful empirical rules for crater formation.)

"Recent European Metal-Cutting Investigations" (Paper #112) by Prof. Milton C. Shaw, Dept. of Mechanical Engineering, Massachusetts Institute of Technology.

"Tool Engineering in Europe" (Paper #113), by J. W. Greve, editor, THE TOOL ENGINEER magazine.

Chairman: James L. G. FitzPatrick, professor and head of Dept. of Mechanical Technology, Staten Island Community College.

Metal Powder Parts Symposium III

8:30 p.m. South Garden
Bellevue-Stratford

"Sintering Structural Parts" (Paper #114), by John H. Speck, chief metallurgist, Amplex Div., Chrysler Corp.

"Finishing Operations" (Paper #115), by Peter E. Young, research metallurgist, Metallurgy Dept., Scientific Laboratory, Ford Motor Co.

Chairman: D. H. Renfrew, chief engineer, Link-Belt Co.

Eli Whitney Memorial Lecture

12:30 p.m. **Pennsylvania Room, Sheraton Hotel**

"Planning for Profit" by Dwillard J. Davis
Vice President of Manufacturing, Ford Motor Co.

(Luncheon $4.50)

Leadership Conference

For Chapter Chairmen and First Vice Chairmen (delegates and alternate delegates), and the Faculty Advisers of student chapters.

8 a.m. to 5 p.m. **Sheraton Hotel.**

MAY 7 wednesday

Automation I

9:30 a.m. Ballroom Convention Center

(Meeting the necessity for automation—planning—economics—basic principles—how to achieve these principles—results—trends in machine tool design—process engineering.)

"Machinery and Automation" (Paper #116), by J. C. Keebler, managing editor, Automation Magazine.

"Automation—the Manufacturing, Sales, Engineering-Triangle" (Paper #117), by William C. Allen, manufacturing director, Headquarters Manufacturing Dept., Westinghouse Electric Corp.

Chairman: William Briner, Standard Pressed Steel Co.

Titanium I

9:45 a.m. Room 200 Convention Center

(Titanium problems—design consideraitons—machining—applicability of cold extrustion process—results of compression tests.)

"On Machining Titanium" (Paper #118), by G. W. Bauer, staff metallurgist, Mallory Sharon Titanium Corp.

"Design Considerations for Cold Extrusion of Titanium" (Paper #119), by Alvin M. Sabroff, assistant chief; Rocco A. Sannicandro, research engineer; Paul D. Frost, chief, Light Metals Div., Battelle Memorial Institute.

Chairman: A. P. Coller, Steam Div., Westinghouse Electric Corp.

Cutting Tool Material II

10 a.m. Room 300 Convention Center

(Cutting tools—future materials—present materials—possible improvements.)

"Cutting Tool Materials of the Future" (Paper #120), by William Reich, manager, Advance Engnieering, Metallurgical Products Dept., General Electric Corp.

"Today's Cutting Tool Materials" (Paper #121), by George A. Roberts, vice president, technology, Vanadium-Alloys Steel Co.

Chairman: William K. Neff, sales representative, Allegheny Ludlum Steel Corp.

Automation II

1:30 p.m. Ballroom Convention Center

(Automation—how far to go—types of equipment—combining machining and assembly—advantages and disadvantages—basic principles—integrated line—costs Operation—typical controls.)

"Types of Automatic Assembly Equipment" (Paper #122), by Lloyd L. Lee, director of automation, LeMaire Tool & Mfg. Co.

"Automatic Manufacturing with the Integrated Line" (Paper #123), by Don A. Cargill, president, Cargill Detroit Corp.

Chairman: James P. Wearn, Steam Div., Westinghouse Electric.

General Tool Engineering IV

2 p.m. Room 200 Convention Center

(Gaging screw threads—elements affecting interchangeabiilty—gage variables—frictional characteristics—new data on coefficients of friction for plastic-bearing materials, bronze, cast-iron, aluminum and sintered metal.)

"Gaging Screw Threads for Acceptability" (Paper #124), by Eric G. Gabbey, owner, O-Vee Gauge Co.

"Frictional Behavior of Metals and Plastics" (Paper #125), by Dr. A. O. Schmidt, research engineer, Kearney & Trecker Corp.; and Elmer J. Weiter, assistant professor of mechanical engineering, College of Engineering, Marquette University.

Chairman: Arthur R. Diamond, engineering consultant, Philadelphia, Pa.

Creative Standardization

2:30 p.m. Room 300 Convention Center

(A four-member panel discussion sponsored by the ASTE National Standards Committee.)

Speakers: Dr. Allen V. Astin, director, National Bureau of Standards, U. S. Dept. of Commerce; W. C. Budge, manager of sales, Atomic Power Activity, Westinghouse Electric Corp.; Roy Trowbridge, director of engineering standards, General Motors Corp.; and Leo B. Moore, associate professor of industrial management, MIT.

CANADIAN BREAKFAST

7:30 a.m.

Constitution Room
Sheraton Hotel

Sponsored by the ASTE chapters of Canada. For Canadian members and visitors and their guests.

ASTE HOUSE OF DELEGATES

(Closed Session)

9 a.m. to Noon **Pennsylvania Room** **Sheraton Hotel**

Meeting convened by President Harold E. Collins. Election of National Board of Directors for 1958-59 term (taking office in October, 1958).

12 noon

Delegates Luncheon, Independence and Constitution rooms, Sheraton.

3-5 p.m.

Election of National Officers for 1958-59 by Board of Directors.

Tour #20—8 a.m. U. S. Steel Corp.
Fairless Works. Limit 50 visitors. Tour of ore piers, docks for ocean liners, blast furnaces, rolling mills, the tinning process and the building where steel is pickled.

Tour #21—8:30 a.m. Standard Pressed Steel Co.
Jenkintown plant. Limit 100 visitors. Tour of heat-treating equipment, metallurgical testing laboratory, gage room, tool and die room and automatic plating line.

Tour #22—9:15 a.m. Philadelphia Navy Yard.
Limit 200 visitors. No cameras permitted. Tour of submarines, destroyer escorts, dry-docks, and part of Navy's "mothball" fleet. Demonstration of on-board fire-fighting at damage control center, and visit to the naval air materiel center and the boiler and turbine laboratories.

plant tours for wednesday

Tour #23—12:30 p.m. Link-Belt Co., Nicetown.
Limit 40 visitors. Machining operations for mechanical power transmission equipment will be shown on this tour. Also heat-treating, production assembly lines and inspection.

Tour #24—1 p.m. I-T-E Circuit Breaker.
Circuit Breaker Div. Limit 100 visitors. Must be U.S. citizens. Visitors will see metal and machine shops where molded case circuit breakers are manufactured for the protection of branch and feeder circuits on power and lighting loads.

Tour #25—1 p.m. Yale & Towne Mfg. Co.
Yale Materials Handling Div. Limit 40 visitors. Manufacture of lift-trucks and electric hoists. Visitors will see how Warner & Swasey chucking machines, profile tracing lathes and Bullard vertical tooling lathes are implemented into the manufacturing process.

Tour #26—1:15 p.m. Cuneo Eastern Press, Inc.
Limit 25 visitors. How many of the leading magazines are printed and compiled.

26th Annual Installation Banquet and National Membership Meeting

6:15 p.m., social hour
Grand Ballroom, Sheraton Hotel
Entertainment by Mary Catherine Trio.

7:30 p.m., dinner
Toastmaster—Harry E. Conrad, Executive Secretary, ASTE

Principal Speaker—William Hazlett Upson
Distinguished humorist and author

Installation of newly elected Officers by President Harold E. Collins

Dress Optional
(Tickets $9)

Ladies Invited

MAY 8 thursday

Automation III

9:30 a.m. South Garden Bellevue-Stratford

(Competitive small-lot production—four basic techniques—product design—minimization of machinery plans—combination of operations—types and application of weldamation techniques.)

"High Production Automation through Low-Speed Mechanisms" (Paper #126), by Julian Wille, chief advance mechanization engineer, Motorola, Inc.

"Application of Weldamation Techniques to Welding Processes" (Paper #127), by John H. Brems, project engineer, Welding Machine Div., Expert Die & Tool Co., Inc.

Chairman: Samuel Pershing Grant, Nuclear Products, Erco Div., ACF, Inc.

General Tool Engineering V

9:45 a.m. North Garden Bellevue-Stratford

(Progressive dies: scope of application—cost, advantages, limitations—lathe chucks: results and recommendations from experiments conducted to determine speeds and feeds—tips on proper application of mechanical toolholders.)

"Capacity of Lathe Chucks" (Paper #128), by E. J. Weller, manager, Carbide Products Design Engineering, General Electric Co.

"What Will Mechanical Toolholders Do for You?" (Paper #129), by Harold E. York, Carbide Product Design Engineering, Metallurgical Products Dept., General Electric Co.

"Economic Advantages of Progressive Dies" (Paper #130), by George E. Gault, tool and die maker, Ehrhardt Tool & Machine Co.

Chairman: John H. Zeder, Jr., chief die designer, The Budd Co.

Automation IV

1:30 p.m. South Garden Bellevue-Stratford

(Automation panel discussion of the application and advantages of automation to small plants and to low-production items. There will also be four brief papers presented.)

(Constitutes Paper #131)

"Simplified Setups for Job Shop Automation," by Raymond Sollohub, manufacturing engineer; and Robert Coen, manufacturing specialist, General Purpose Motor Dept., General Electric Co.

"Automated Special Machines for Low Production Parts" by Howard N. Maynard, president, Snyder Tool & Engineering Co.

"Can the Small Plant Afford Automation?" by Ralph Eshelman, engineering editor, Iron Age Magazine.

"Automation as Applied to Small Lot Production" by Werner O. Miller, chief of automation, Textile Machine Works.

Chairman: Michael R. Lettieri, Red Bank Div., Bendix Aviation Corp.

plant tours for thursday

Tour #27—8:15 a.m. Leeds & Northrup Co. North Wales plant. Limit 50 visitors. Electronic controls. Tour of all operations, including toolmaking and inspection, heat treating, parts machining, finishing, mechanical assembly, calibrating, testing and materials handling.

Tour #28—9:15 a.m. Philadelphia Navy Yard. Limit 200 visitors. No cameras permitted. Tour of submarines, destroyer escorts, drydocks, and part of Navy's "mothball" fleet. Demonstration of on-board fire-fighting at damage control center, and visit to the naval air materiel center and the boiler and turbine laboratories.

Tour #29—10 a.m. Simonds Abrasive Co. Div. of Simonds Saw and Steel Co. Limit 37 visitors. Grinding wheels manufacture, from crushing of crude abrasive through final inspection and shipping. One thousand-ton, 4-station presses and automatic presses will be seen. Movie and luncheon included.

Tour #30—1 p.m. Yale & Towne Mfg. Co. Yale Materials Handling Div. Limit 40 visitors. Manufacture of lift-trucks and electric hoists. Visitors will see how Warner and Swasey chucking machines, profile tracing lathes and Bullard vertical tooling lathes are implemented into the manufacturing process.

ASTE

Board of Directors Annual Meeting

9 a.m. to 5 p.m.

Constitution Room Sheraton Hotel

All members welcome to attend.

CAREER DAY

9:30 a.m., Convention Center

Sponsored by the ASTE National Education Committee. Program planned to present information on career opportunities in tool engineering to students of high schools, technical institutes, and colleges in the Philadelphia area.

Technical institute and college students,
Room 300, Convention Center.

High school students,
Ballroom, Convention Center.

(Attendance by special invitation only)

Calling ALL Liberty Belles

"That should hold it until Waldo gets out of the Welding Seminar."

Convention widows should be a thing of the past. So think the wives of the Philadelphia host committee, who have put together a package of women's activities to lure the usual stay-at-home wife to William Penn's "greene countrie towne," now convention-conscious Philadelphia, along with her husband.

They have planned the schedule with two things in mind—feminine appetite for all things historical or nostalgic, and an ASTE wife's natural desire to become better acquainted with the people, projects and social events connected with the scientific society to which her husband belongs. The program, thus planned, provides a good balance between sightseeing excursions through terrain long-labeled as the birthplace of American Independence, and affairs serving a specific ASTE purpose.

In the latter category, visiting women are invited to join their husbands at the opening event of the Convention, the Philadelphia Day luncheon on Thursday, May 1. Joint affairs slated for the following week include the Honor Awards dinner, Monday night, and the Eli Whitney memorial lecture the next day. Gala event, and perhaps high point of the Convention Week, is another "member and wife" affair, the annual Installation Banquet, which will feature not only the installation of next year's officers, but the rollicking wit of humorist-lecturer William Hazlett Upson of Saturday Evening Post fame.

Most women love to talk, and they will have their first chance (officially) to chatter uninhibited by their better halves at the "get-acquainted" continental breakfast Saturday, May 2, at the Warwick.

Atlantic City Day, described more fully on pages 142 and 152 of this issue, will bring husbands and wives together for a leisurely bus trip through Jersey's "pine belt" to the most famous bathing spot of America. The Ambassador Hotel has been earmarked as Atlantic City headquarters, and its heated salt-water pool will be available for those not caring to brave the breakers. It will also be the scene of a social hour and dinner dance, before the day has run its course.

Special sightseeing tours have been arranged to show women the spots most famed for reflecting Philadelphia's heritage. A tour slated for Friday afternoon will cover many "musts" for history lovers—Betsy Ross' house in which the stars and stripes were first stitched together; Independence Hall, scene of the drafting of our country's constitution, and long considered one of the most beautiful public buildings of the colonial period; the Liberty Bell; Benedict Arnold's mansion; Christ Church; and many others.

An all-day trip to Valley Forge, where General Washington and his army spent the memorable winter of 1777-78, is scheduled for Tuesday, May 6, and will include a luncheon at the famous Bull Tavern.

The following day will see "visiting ladies" sampling spaghetti at V. LaRosa and Son's factory, producer of macaroni, spaghetti and sauces.

In addition to these scheduled events, women's committee planners have made provision for a hospitality lounge in the Poor Richard Room of the Benjamin Franklin Hotel, where foot-weary sightseers can "drop in for a spot of tea," between 2 and 4 each afternoon, and at other times just relax and enjoy the chit chat, and perhaps a casual game of bridge, with the other women who have discovered what fun it is to be a convention wife instead of a convention widow.

"No, lady, it's not alive."

members in the NEWS

Chief Engineer **George A. Kendall** of the Wickes Corp.'s Machine Tool Div., Saginaw, Mich., has been appointed divisional president and general manager. Mr. Kendall joined the division as an engineer in 1936, and worked his way up through the ranks. He is a member of Saginaw chapter.

Nylok Corp., self-locking fastener firm of Paramus, N. J., has promoted **Tim J. Buckley**, Elmira chapter, to vice president and general sales manager. Mr. Buckley joined Nylok in 1951 as superintendent of the company's plant, then located in Elmira, N. Y., after holding posts with General Electric and the American Type Founders Co. He became Nylok vice president of manufacturing in 1955.

Reorganization of the sales branch, Electro Minerals Div. of The Carborundum Co., Niagara Falls, N. Y., has resulted in appointment of **Russell W. Fitch**, former field engineer, to product sales engineer. He belongs to Buffalo-Niagara chapter.

Francis E. Holland, Toronto, has been appointed assistant sales manager of the Butterfield Divs. of the Union Twist Drill Co. in Quebec. Mr. Holland's duties will include direct responsibility of sales in Canada.

Harry C. Cooper, Kansas City chapter, has been named manager of A. Milne & Co.'s tool steel warehouse and branch office in St. Louis. The firm is distributor of solid and hollow tool and die steels.

Cal E. Edwards, abrasive specialist with Ford Motor Co., Dearborn, Mich., and a member of Detroit ASTE chapter, has been elected president of the Detroit unit of the American Society of Abrasives. **Leland K. Pruett**, also with Ford, has been named a national director of the society, which was formed to foster product standardization in the grinding and finishing industry.

Historian of the Milwaukee chapter, **Paul E. Butzin**, and **Robert C. Wacker** and **Don R. King** have been certified as registered professional engineers by the Wisconsin Society of Professional Engineers. Mr. Butzin is vice president and chief engineer of Simplex Machine Tool Corp., and has a wide and varied experience with Allis-Chalmers, Sterling Motor Truck Co., A. O. Smith, Cutler-Hammer, Kearney & Trecker, and others. Mr. Wacker is general sales manager of Sterling Tool and Mfg. Co. and for three years was a member of the chapter board of directors.

J. D. Anderson, past chairman of Detroit chapter, has left Packard's after 17 years to become sales and service engineer for Detroit Reamer and Tool Co., at Birmingham, Mich.

James M. Stevenson, Philadelphia, has been appointed sales manager of vacuum melted products of the Metallurgical Products Dept., General Electric Co.

Promotion of **Robert Fitzsimmons**, Keystone, to senior manufacturing engineer at Daystrom Instrument has been announced.

Quality manager of Pratt & Whitney Aircraft Div. of United Aircraft Corp., **Edward S. Marks**, has retired after 18 years' service with the East Hartford, Conn., firm. After a few months of travel, Mr. Marks plans to do consulting work in quality control management. He is in Hartford chapter.

J. Hartness Beardsley, Twin States chapter, was elected president of the Bryant Chucking Grinder Co. at an organization meeting in Springfield. A director of the firm for some time, Mr. Beardsley succeeds William J. Bryant. The company recently became a subsidiary of Ex-Cell-O Corp., Detroit.

Metallurgical Products Dept. of General Electric Co. has appointed **Raymond J. Moessner**, Detroit, sales representative in their southern district.

Alfred B. Wells, Atlanta, has been promoted from assistant branch manager to branch manager for Crucible Steel Company of America's Atlanta sales branch.

Robert V. Peterson, Detroit, has rejoined Latrobe Steel Co.'s Detroit branch as a special sales representative, after two years in the tooling field.

At the recent management and sales conference held by The Cincinnati Milling Co., **Robert C. Bevis**, Cleveland, was appointed sales manager.

Sundstrand Machine Tool Co. announced the election of **Carl L. Sadler**, Rockford, to vice president in charge of Sundstrand Aviation Div. at Rockford.

Society continues to grow

Continued steady growth of the ASTE, notwithstanding the adverse influence of industry cutbacks in recent months, is indicated in the latest membership status report by Chairman Carl A. Darger of the national membership committee.

Figures as of Jan. 15, this year, show a net gain of 1886 members since the like date in 1957. This represents a better than five percent increase, and puts total membership near the 39,000-mark.

The one-month gain, from mid-December to mid-January, was 205.

Mr. Darger, in his report to his committee, called attention to a praiseworthy drop in the number of nonpayment removals from the membership rolls.

Further indication of growth potential came out of the recent Chicago meeting of the national committee, when 22 areas were cited where interest has been evidenced in the formation of new chapters.

Inch becomes BROAD BARRIER to allied unity

. . . need to standardize cited by Sydney speaker

Less than a hundred thousandth part of an inch constitutes a broad and dangerous barrier indeed to the unity of the English-speaking nations of the world, Australian tool engineers have been warned.

The imperative necessity for England, Canada, Australia, and the United States to agree on a standard measurement for the inch, dictated by the need for quick interchange of complex missiles components, was cited by U.S. industrialist Louis Polk in a talk to members and guests of Sydney chapter, American Society of Tool Engineers.

Three different legal definitions of the inch, as adhered to by America, Canada, and the United Kingdom, have assumed roadblock proportions in the light of recent rocketry developments, he said. Australia has not yet established a fixed standard.

Mr. Polk, first winner of the ASTE's Eli Whitney memorial award, is president of the Sheffield Corp., Dayton, Ohio, and a vice president and group executive of Bendix Aviation Corp. He is a member of the Society's national research fund committee and of Chapter 18. His Sheffield firm, a major developer and producer of gaging and measurement devices and special precision machines, operates the Eli Whitney Metrology Laboratory in Dayton to aid industry in maintaining and improving precision measurement standards.

Speaking at the Lecture Hall in North Sydney on Feb. 11, Mr. Polk noted that the almost infinitesimal differences in the inch standard have been of negligible importance until recently. Advancements in missiles manufacture, however, now require accuracies of one millionth of an inch. A gage block used by industry, which is calibrated to the standard now used by one of these nations, will probably fail to meet production tolerances in the other two, Mr. Polk asserted.

In recommending an early solution of the international inch problem, Mr. Polk likened the small differences involved to "the legendary horseshoe nail for want of which a kingdom is lost."

"Not just a single kingdom is at stake, however, but rather a whole world—a free world," he added.

Present variations could seriously limit the interchangeability of vital defense products, particularly ballistic missiles, and could cripple the efficient swapping of goods in commerce and of scientific and technical information, he warned.

Some have suggested, quite logically in Mr. Polk's opinion, that England and the United States reset their standards to conform with the "one in the middle," the Canadian inch, which is exactly equal to 2.54 centimeters. Then the Australian Standards Association could work for conformity when it adopts a formal standard.

Chapter Plans Campaign

Mr. Polk's two-day visit in Australia and his address in Sydney coincided with the ASTE chapter's drive to "breach the gap between the issuing of standards and their successful adoption in industry," in the words of J. S. Marshall, chairman of the chapter standards committee.

Toward that end, the Sydney committee has planned a five-point standards program for Australia and has sought the assistance and advice of ASTE headquarters and other units in the United States. Under the plan, the chapter members would (1) prepare articles and lectures on advantages and applications of standardization; (2) compile and distribute bibliography of published standards relevant to tool engineering; (3) publish in the chapter bulletin new relevant standards with a brief review; (4) form study groups to interpret complex standards, prepare simplification notes and application sheets; and (5) in conjunction with the chapter education committee, organize panel discussions of standards.

It is believed likely that the ASTE will become a sustaining member of the Australian Standards Association, just as it is now with the Canadian Association.

Spokesmen in the standards "league of nations," the International Standards Organization, see in the move for a standardized inch an area for agreement that would not arouse opposition among the other ISO members, which are metric-using nations.

april brings shower of technical conferences

April may mean showers to the weatherman, but to ASTE chapters scattered across the eastern part of the United States, it has come to mean the month of conferences. This April four of the "on-campus" variety and one regional one have been scheduled.

The first on-campus conference "north of the border" has been set for April 19 at McMaster University in Hamilton, Ont. A thus-far unique event for the nine Canadian chapters sponsoring it, this initial conference will be particularly keyed to tooling for Canadian manufacture. Four broad topics for discussion, and the lecturers who will cover them are: manufacturing management, by National Director W. A. Thomas, of Ford Motor Co. of Canada Ltd.; pressroom problems by John W. Lengbridge, of Aluminum Goods Ltd., and member of the national professional engineering committee of ASTE; metallurgical aspects of machinability, by E. J. Krabacher of The Cincinnati Milling Machine Co.; and ceramic tooling, by Robert T. Hook, Warner & Swasey, Cleveland. Society President H. E. Collins has accepted the guest-speaker spot on the program.

Double Feature on the 19th

Also on April 19, Purdue's campus will be the scene of the sixth tool engineering conference to be sponsored jointly by the Indiana council of chapters, the university, and the national education committee of ASTE. Conference Chairman Orville D. Lascoe announces the program's theme as "Economy Trends for Tomorrow's Tooling," with six technical sessions expanding the theme. These sessions cover such trends as explosive forming, impact forging, numerical and tracer controls, automatic machines for short runs, and advantages of spiral-point drills. A report on the press research project at Purdue will complete the technical agenda, along with special machine-shop demonstrations by the hosting Purdue student chapter.

The fourth annual college-industry conference, slated for April 12 at the State University of Iowa, will point toward teaching production techniques for small-lot manufacturing. Conferees will hear about machining methods for titanium and zirconium, economical applications of arc-welding developments, new techniques in heat treating, tape-controlled jig borers, and applications for epoxy resins in tool and die manufacture, among other subjects. Society Vice-President Dale Long and Education Committeeman Kenneth Trigger from the University of Illinois will be on the scene representing the national viewpoint. Women's programs have been planned for both the Purdue and the Iowa conclaves.

Detroit chapter is planning a repeat of its 1956 conference at Wayne University on Thursday, April 17. The seventy-minute sessions scheduled two at a time throughout the day will deal with tool control systems, transfer vs. dial machines, the "building block principle" on machinery, advantages of "in process" gaging, and production control. Also listed are talks on casting and forging engineering, and how both quality control and methods relate to the individual tool engineer. During the evening the scene will be shifted to the Engineering Society of Detroit for a movie, banquet, and a technical address.

Little Rhody Hosts Eastern Meet

Central New England's regional conference, an annual event, traveling among the sponsoring chapters, will this year be based at the Sheraton-Biltmore in Providence, R. I. on April 25. According to the advance program notes, conferees will spend the morning learning about automation from Dr. Harland F. Stuart, M. E. professor at the University of Rhode Island; and about nuclear power from Richard Delagi, who helped in the Atomic Energy Commission's development of the new fuel-element geometries for the Savannah and Hanford production reactors.

An afternoon devoted to tours of four local plants will follow a luncheon and address on satellites, both natural and man-made, by Dr. Charles H. Smiley of Brown University's astronomy department. Plants booked for tours are Brown and Sharpe, Corning Glass Works, Narragansett Brewing Co., and the Providence Journal.

The day will end with a social hour and banquet at which James Meehan, sales director of grinding machines for Brown and Sharpe, will be the featured speaker. Central New England area chapters consist of the Southeastern, Northern and Springfield, Massachusetts chapters; Boston, Merrimack Valley, and Worcester, in addition to the Little Rhody chapter which this year plays the role of host.

Director Tosses Bouquets To Cal Polytech Students

Ben Berlien, national director and acting ASTE emmisary to students in the California area by virtue of recent guest speaker assignments before school age audiences, has this to say about his visit to Student Chapter No. 12 at California Polytech:

"This chapter operates verbatim according to chapter procedures. We could well use them as a shining example to many of our chapters, and their successful operation attests to the value of the points stressed in the Chapter Procedures booklet."

Mr. Berlien further reports that of a current membership of 108, forty were new this year, thanks to membership chairman Bill Grubbs. Chairman Thayne Wilson operates according to executive committee procedure, holding a separate meeting in advance of the regular membership meeting.

Program chairman James Ryan and his two committeemen work well in advance of meeting dates, having to cope with the problem of a minimum 200-mile distance between their location in San Luis Obispo and industrial centers such as Los Angeles and San Francisco, which makes the booking of speakers no easy task.

The chapter's substantial treasury provides membership pins free of charge and subsidizes part of the cost of a ladies night program. A constant income is provided by chapter ownership of the campus Coca Cola machine concession, which is serviced on an assignment basis by the members.

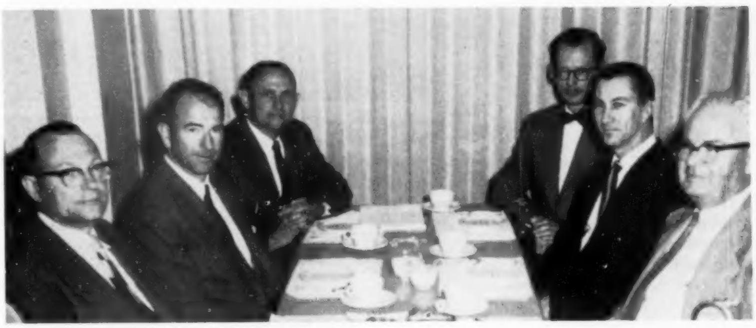
That the student members were as enthusiastic about Mr. Berlien's talks on ASTE and heat treating as he was about the chapter's operation was evidenced by their post-lecture question period which lasted a full hour.

At Golden Gate's student night, Mr. Berlien, whose chapter this is, addressed an audience that included 114 student guests. His talk concerned basic concepts of tool engineering applied to new products and research.

L. A. Scholarship Doubled; Two Winners Receive $250

Two young men from California State Polytechnic College were so capable and deserving that the Los Angeles chapter's executive committee voted to award two scholarships instead of one this year. Receiving their checks for $250 are Fred Tarver and Daniel Dickey. Making the presentation is George Adams, '57-'58 education chairman newly named as chapter treasurer, who sifted applicants down to these two boys. Applicants must be taking one or more courses in tool engineering and have a general interest in allied fields.

Tomorrow's Tool Engineers

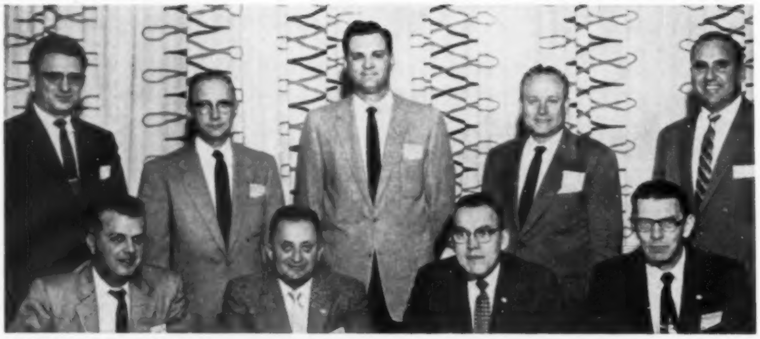


The school advisory committee of ASTE in California met with Los Angeles City College to select and initiate an A.A. degree college curriculum in tool engineering. Meeting together are: left side of table, front to rear, Charles W. Trigg, dean of instruction at the college; Ed Cutler, national education committee; and Ben Hazewinkle, L.A. chapter. Right, front to rear, are: George Adams, L.A.'s 1957 education committee chairman who laid the groundwork for the course; Robert Smith, and Engineering Instructor Carson F. Thomson, from the college.

Wentworth Institute

More than a hundred members of the Wentworth student chapter heard C. G. Schelly, educational research director of The DoAll Co., present his "Story of Measurement" in the Wentworth Auditorium. Here, Mr. Schelly, left, is discussing one of the traveling display's panels to the chapter's faculty advisers, Charles W. Moody and R. S. Ames.

chapter news and views



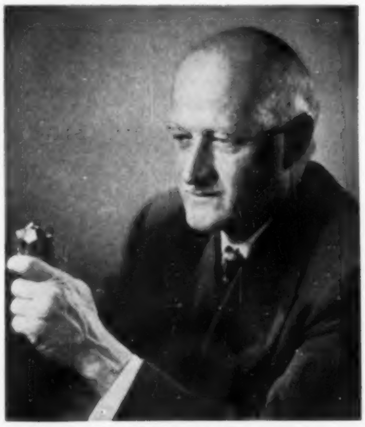
NORTH TEXAS—Officers of the new south central council of chapters, which was formed at a February meeting in Dallas, are (standing, left to right) William E. Unruh, Wichita chapter, second vice chairman; Joe E. Morrow, Tulsa, secretary; Ben C. Harris, North Texas, chairman; Charles K. Hay, Houston, first vice chairman; and Chester H. Chiodo, San Antonio, treasurer. Seated are members of the national family who attended the meeting. They are (left to right) F. Paul Simpson, national program committee; Irving H. Buck, national director; Carl Darger, membership chairman; and A. E. Unruh, vice chairman, membership.

Worcester Studies Hydraulic Presses

Versatility of hydraulic presses in production of small and large parts was emphasized in talks and films at the Worcester chapter's annual past chairmen's night meeting.

Francis R. Springer, eastern regional supervisor of Denison Engineering Div., American Brake Shoe Co., cited the advantages of hydraulic presses in production blanking and forming. The steady powerful push, instead of the sharp blow of a mechanical press, reduces die damage, wear and down time for regrinding of the die face, he said. Films on job production, projected by Larry Kuneck, also of Denison Engineering, showed that hydraulic presses with the proper tooling can be used for almost any type of end product desired.

—Robert A. Cusson



PITTSBURGH—Philip M. McKenna, president of Kennametal, Inc., spoke on hard carbide alloys for parts of machines other than cutting tools, at the regular monthly meeting attended by 142 members.

Detroiters Finish Management School

Five members of Detroit chapter have received graduation certificates from the Material Management Center of Wayne State University. Those graduating at exercises Jan. 24 were James J. Gambino, Robert Studt, John C. Preece, Everett A. Randlett, and Leonard J. Smith.

Clarence B. Hilberry, Wayne president, spoke on "Our Stake in Higher Education." Dr. Hilberry said the center was "not a child of international catastrophies. It was born of a need of men carrying heavy responsibilities in our industrial life to try to catch up with the explosion of knowledge in our generation, with the terrifyingly rapid changes in industrial processes, changes which we are told are still too slow."

The center was established at the request of industry in 1952, to supplement technical training by providing an educational program for management responsibilities in industry.

—Joseph Wrobel

St. Louis Sponsors Technical Courses

St. Louis chapter, in cooperation with the city board of education, is sponsoring two courses in manufacturing methods at the O'Fallon Technical High School.

Excellent response during the fall term prompted the executive committee to sponsor the classes again for the second semester. Enrollment is open to Society members but not limited to them.

Instructors are chapter members Herman Zimmerman and Jim McNeely.

—W. A. Russell

London TV Interviews Spark Interest in ASTE

The series of TV interviews of tool engineers which the London-St. Thomas chapter has been participating in has paid off in terms of increased membership during the weeks the series has been running, Editorial Chairman Ray Hind reports. The series came to an end March 3 when Al Desadeleer, general manager of Kelvinator's London plant, spoke from management's viewpoint about career opportunities existing in the tool engineering field. CFPL-TV donated 10-minute spots on the "Panorama" show for interviews with six London chapter members representing various positions from toolmaker to general manager.

The distance from London to Sarnia was discovered to be no deterrent for 100 members and guests of the chapter who turned out on election night for the tour of Electric Auto-Lite's Sarnia plant. Company Vice President W. E. Orth welcomed the visitors, after which a well-organized tour of the facilities was made. Despite a late start and much ground to be covered, members got a chance to view interesting techniques, among which was the mechanized spark plug assembly line. *R. Hind*

ELMIRA—Tool engineers watch demonstration of latest machine tool during tour of Hardinge Bros., Inc., manufacturer of lathes and milling machines, collets, feed fingers, and pads for machine tools. Chapter also toured plant of American LaFrance Corp., maker of fire-fighting equipment. *—E. J. Leszyk*

Student Loan Fund Set Up by Chapter

A revolving loan fund of $500 has been established by the Buffalo-Niagara Frontier chapter to perpetuate the memory of Harvey W. Ellis, a past chairman of the chapter.

The fund is named for Mr. Ellis, who died last year, and will be loaned to needy students enrolled at the Erie County Institute. It will be administered by the institute loan committee.

Nelson M. Hopkins

600 Turn Out for Tour Of New Lincoln Plant

More than 600 tool and body engineers of the Detroit area viewed the unitized body construction process at the new Lincoln assembly plant near Wixom, Mich. on Feb. 20. The tour was jointly sponsored by the automation sections of the Detroit chapters of the Society of Body Engineers and the ASTE. Ed Till is chairman of the ASTE automation group.

The visitors heard the plant's development story from W. D. Singleton, plant manager. He told how the industry's newest plant was specifically planned and built for the unit construction of Lincoln, Continental and Thunderbird vehicles. The factory went into production in August, 1957.

After talks by A. D. Weir, Lincoln planning and engineering manager, and E. F. Warner, production manager, the ASTE and SBE members and guests saw a 30-minute movie, "The House of Quality," showing the plant in operation. A tour of the 1,374,000-square-foot plant followed.

Highlights of the evening were the resistance welding operations in unitized body building, involving 7500 weld points; the complex paint department, with its rust-proofing body dip tank—and the dinner in one of the plant's four cafeterias.

Sputniks Do 'Back-Handed Favor,' Help Pack Seminar at Dayton Club

DAYTON—Here's part of the crowd of 378 who turned out for the first of four sessions on hydraulic power held for Dayton area tool engineers.

"The Russians and their Sputniks have done us a back-handed favor," was the way one member of the Dayton chapter explained the large turnouts for a four-session educational seminar held during February.

The manager of the Engineers Club, where the sessions were held, agreed with the tool engineer that the size of the crowds could perhaps be attributed to the national interest aroused by the dawning of the space age. He said the turnout of 378 at the first session was the largest technical gathering at the club in his 11 years on the job.

Subject of the seminar, which was specially designed for tool engineers and technical personnel of industry in the Dayton area, was "Hydraulic Power and Its Application to Machine Tools." The three-hour sessions covered fundamentals of hydraulic fluids; generation of hydraulic power; transmission and control; and industrial applications. Instructors were C. R. Schmitt, lubrication division manager for E. F. Houghton & Co.; Allen Perry, district sales manager for Vickers Co.; Ellis Born, sales engineer with Denison Engineering Co.; and Robert Veraar, hydraulics division sales manager, Racine Hydraulic and Machine Co. *—Earl E. Todd, Jr.*

Plastic Tools Seminar Planned by Mansfield

Members who heard Joseph Tierney, plastic tool division manager for Houghton Laboratories, Olean, N. Y., speak at their February meeting, decided that his topic, plastic tooling, was of such great general interest, that a seminar on the same topic has been planned for a future date.

chips and chatter

Dayton

The election of officers and technical meeting were held at Suttmiller's Restaurant, Feb. 17, with 40 members present. Ralph J. Guess, chief engineer for the Vulcan Tool Co., gave a talk covering the development and use of vulcanaire jig grinding attachment. A short film showed and described various applications.

Montreal

C. G. Schelly, director of educational research, The DoAll Co., spoke on "The Story of Measurement" at the Feb. 10 meeting held at the Montreal-Canadian Legion Hall.

Western Reserve

On Feb. 25, at Cafe 422, Warren, Ohio, Donald Harshbarger, sales representative for Monarch Machine Tool Co., showed a movie, "The Chips Are Down," followed it by a question and answer session on feeds, speeds and cutting tools for respective types of metals. Election of officers for the coming year followed.

Paterson

Brownstone House was the scene of the Feb. 3 meeting, where 45 members heard Alfred S. Elston, acting manager of methods, Mack Trucks, Inc., speak on "Facility Justification." Mr. Elston stressed the importance of proper facility planning and highlighted the need of factual information pertaining to quality and economic justification before submitting requisitions for new machine equipment to management.

Phoenix

A lecture accompanied by slides was the main feature of the Feb. 10 meeting at Westward Ho Hotel. It was given by Glen H. Stimson, manager of sales and chief engineer, Gage Div., Greenfield Tap & Die Co. Election of officers followed the lecture.

San Francisco

Brentwood Lodge was the scene of the Feb. 20 dinner meeting, with Frank J. Lamphere speaking on "Optical Tooling." Mr. Lamphere, with 22 years' experience in the tooling industry, has from the very beginning of optical tooling followed the application of this science in its spread through the industrial field.

An academy award movie and numerous slides were shown as visual aids to the basic technology of the subject.

Peterborough

"Automation in Russia" was the subject of a talk given at the Feb. 6 meeting by Nevin L. Bean, technical assistant to general manager, Ford Motor Co. The meeting was held at Peterborough Golf & Country Club. Officers were nominated for the coming year.

Milwaukee

The technical meeting Feb. 13 at the Serb Memorial Hall drew 130 members. Charles E. Van Riper, grinding wheel engineer for Norton Co., spoke on "Proper Selection of Grinding Wheels," discussing the various types of wheels and their uses. A question and answer period followed a 30-minute movie.

San Fernando Valley

Byron R. Russell (shown above, center), president of Airline Welding and Engineering Co., Hawthorne, Calif., spoke on "Production Welding and Welding Fixtures" at the February meeting. He described methods of fusion butt welding by automatic machinery that positions, chucks, moves and ejects finished tubes and cones. The machine produces uniform weld size, controlled bead width and 100 percent penetration in metals up to an inch thick. Here he shows a welded .0005-inch-thick sample to Chairman R. Broomell (right) and H. L. Meredith.

Rockford

Paul Harrington, supervisor of magnesium sales in Chicago territory; and Don Johnson, technical service and development group, Dow Chemical Co., gave a technical discussion on the use and application of magnesium in jigs, fixtures and machinery at the Feb. 13 meeting held at Lafayette Hotel. It being Student Award night, prizes for first-semester drawing contest were presented to first, second and third-place winners from schools in this area.

Pittsburgh

The regular monthly meeting with 138 members present was held Feb. 7, with John Wilson, vice president of Thompson Grinder Co., the featured speaker. His subject was "Crushed Form and Surface Grinding," which he has presented for the 46th time to various ASTE chapters. Mr. Wilson, a well-known authority in the grinding field, illustrated his lecture with projections from strip film, pointing out the design and construction of precision grinding machines.

Syracuse

Harold L. Murch of Jones & Lamson Machine Co. was the featured speaker at the Feb. 11 meeting at the Onondaga Hotel. Election of officers for the coming year followed.

Jackson

Col. L. S. Fletcher, ASTE director of research, honored and presented 28 affiliate members with plaques at affiliate member night meeting Feb. 17, at Arbor Hills Country Club. Col. Fletcher outlined the activities of the ASTE research program, present and future. Five members were awarded ASTE pins for signing up new members, of which the chapter now has a total of 215.

Ann Arbor

Charles E. Beck, manager of capital investment analysis and appropriations secretary, Ford Motor Co., spoke on the subject "Capital Facilities Planning and Analysis" at the Feb. 19 dinner meeting held at Ann Arbor American Legion Home.

Mid-Hudson

On Feb. 11, 61 members and guests heard Don Ahearn, president of Universal Instruments Corp., speak on "Low-Cost Stampings." L. A. Moses and D. R. Evans assisted Mr. Ahearn in the discussion of steel rule dies, DiAero dies, notching dies, nibblers, etc. The talk was illustrated by slides and samples.

Western Michigan

Richard L. Rouviere, market extension engineer for Devcon Corp., was the speaker at the Feb. 10 meeting at Varsity Grill. His illustrated presentation was on "Plastic Tooling."

San Antonio

"Teamwork" was the topic, accompanied by slides, given by R. E. Balmat, contact metallurgist from Bethlehem Steel Co. at a recent dinner meeting. Guests were Robert Robertson, sales representative of Bethlehem Steel; Jerry Rounds of Earle M. Jorgenson Co.; and a number from San Antonio industries.

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SANTA CLARA VALLEY—Lee Baxter, representative of A. B. Svetsmekano, Sweden, shows his audience what can be done with the "Pullmax" universal shearing and forming machine. With little or no extra tooling it can also bead, louver and cut both inside and outside of circles and random paths. —*Dresden Smith*

Springfield, Mass.

At the Chalet Restaurant Feb. 10, 90 members gathered for a dinner meeting and technical session. Eric G. Messler, eastern district manager and manager of Cormant Div., Sandvik Steel, Inc., was the speaker. The program started with a movie, "Modern Land of the Vikings," describing Sweden and some of her history, after which Mr. Messler gave a talk on Swedish steel. New officers were elected for the coming year.

Saginaw Valley

At the Feb. 13 dinner meeting, held at Zehnder's Hotel, Frankenmuth, Everett L. Sinclair, grinding engineer at Norton Co., spoke on "Diamond in Industry." His talk was illustrated with color slides, which included applications in lines of work foreign to usual activity. Officers were elected for the coming year.

St. Louis

Two-hundred-forty members and guests assembled at Ruggeri's Restaurant Feb. 6 for old timers' night and election of officers. Donald M. Laflin, western and southern districts sales manager of Gidding & Lewis Machine Tool Co., spoke on "Automation of Numerical Control," illustrated by a numerical film. Seventeen old timers (members with 15 years of service) were honored with 15-year certificates.

Chips and Chatter

ANN ARBOR AREA—Members of Chapter #79 view operations at close hand during tour of the Spring and Bumper Plant, Chevrolet Div. of General Motors. Operations seen were forging, heat treating, stamping, welding, and particularly the operations of the transfer presses and the plating line. Robert Dow, manager of the plant at Livonia, Mich., and Ray Arnold, production manager, spoke to the group. —*K. H. Moltrecht*

Philadelphia

The regular monthly meeting was held at the Engineers Club on February 20 with some 75 members and guests who heard talks on "Die Design" by R. W. Hohl, chief Engineer, Hallowell Div., Standard Pressed Steel Co.; and "Die Manufacturing" by E. A. Isberg, tool coordinator, also with Standard. The talks were accompanied by slides and a short film on tool and diemaking.

Des Moines

National Director Leslie Seager of the Eimco Corp. was the guest speaker at the Feb. 12 meeting held at Des Moines Golf & Country Club. His subject was "Tool Engineering Education," followed by a discussion which indicated a keen interest in the subject.

Akron

"My Major Impressions at the Pentagon" was the title of the speech given by Lee R. Shannon, former deputy assistant secretary of defense, and at present connected with Firestone Tire & Rubber Co. The meeting was held at Iacomini's Restaurant and the technical session included election of officers.

Windsor

On Feb. 10 at Prince Edward Hotel, 125 members and guests assembled to hear George W. Barnes of the Norton Co. speak on "Ceramic Tooling, a Challenge of Physical Properties."

Hamilton District

At the Brant Hotel, members' night, Feb. 14, 88 attended the 152nd regular dinner meeting. George W. Barnes, sales engineer for Norton Co. presented a talk accompanied by slides, giving the properties and tool geometry for aluminum oxide cutting tools. Following this Mr. Barnes showed a colored film entitled "Machining with Nonmetallics," which demonstrated single-point cutting operations, using ceramic cutting tools.

A. S. Barber, chairman of the chapter standards committee, gave the coffee talk on the objectives of the ASTE standards committee.

ERIE—Talk on "Vibratory Parts and Materials Handling Equipment" was given before 60 members at the February technical meeting by Woerner McKinsey, Jr. (right), sales manager of the parts feeder department, Syntron Co., Homer City, Pa. With him are (left) S. D. St. Clair, also of Syntron, and Chairman H. W. Sedler. —*Leo B. Weiner*

Centinela Valley

The technical program for the February meeting was presented by Robert W. Fitzpatrick, representing IBM Machines on "Electronic Data Processing Machines." Mr. Fitzpatrick stressed the speed and accuracy of these machines in the processing of data and providing the required information that is useful in the engineering fields.

Joseph Cooper, as coffee speaker, representing the California Wine Advisory Board, gave a talk on California wines.

Golden Gate

Election of officers was the highlight of the Feb. 19 dinner meeting at Spenger's Fish Grotto. An outstanding sound-color movie of "The Ryan Vertijet" was presented; also movies on surface grinding and cutter sharpening. There will be a spring session in fundamental tool designing and production tooling, starting Feb. 11 and continuing until June 5, subjects being covered by lectures and examples, motion pictures, guest speakers and plant tours.

Birmingham

At the Feb. 20 technical meeting and election of officers, held at the Thomas Jefferson Hotel, members heard Walter Krug, works manager, Continental Gin Co., talk on "Interplant Communication." His lecture dealt with the need for better means of expressing ideas and relaying information in order to expedite work in the shop. Drawing on his vast experience in tool work, Mr. Krug offered many helpful suggestions on improving interplant communication.

Wichita

Eighty members participated in a plant tour of Coleman Co. plant, conducted by Earl Maphet, project engineer, and his associates on Feb. 12, where they were privileged to witness many complicated press lines and assembly section for the Coleman air conditioner.

Lansing

On Feb. 10 at Lansing Civic Center, 60 members attended the meeting, where they heard James E. Thompson, vice president of Western Stamping Co., talk on "Stampings and the Toy Business." He mentioned many problems and how to overcome them in the product design, tooling and production of children's toys.

Atlanta

At the regular monthly meeting on Feb. 18 new officers were elected for the coming year. After the brief business session, R. S. Olson, district sales manager for Dow Chemical Co., presented a program on "Magnesium, the Modern Metal for Tooling" through the medium of lecture, movies and slides.

Tri-Cities

On Feb. 12, election night, C. A. Barrett, manager of Die-Draulics Grip Inc., presented an illustrated program on die-draulic equipment, the principles and applications of hydraulic pressure to die pads. The meeting was held at the American Legion Club Rooms in Moline.

Schuylkill Valley

A technical presentation by Frank Meyer, Jr., manager, Instrument Gage Div., Taft-Peirce Mfg. Co., was the highlight of the Feb. 11 dinner meeting at the Berkshire Hotel. Officers for 1958 were nominated.

Lorain County

"Tooling for Automatic Bar Machines and Chuckers" was the subject of a talk given at the Feb. 5 meeting at Sheffield Restaurant by R. R. Rhodehamel, vice president of National Acme Co. He spoke on the development of the automatic bar machines from their early design to the present and how each new engineering design aided in increasing their speed.

Fond du Lac

Ty Miles, vice president of Rex Broaching Machine Co., spoke on "Design and Manufacture of Broaches," with broaches in various stages of manufacture on display. The dinner meeting was held Feb. 14 at Bernward Hall.

Detroit

The Feb. 13 senior section meeting and election night was held at the Rackham Building, where Harry R. Bentley, manager of the Chrysler Co. Trenton Engine plant, spoke on "Key to Successful Management," discussing management problems encountered in setting up a successful management team from the plant manager down. The coffee speaker was James C. Champman, quality control supervisor of the Joseph Campau engine plant. His topic was "Quality a Full-Time Job."

Mississippi

Feb. 7 was the date of the dinner meeting held at the Tupelo Motel. Sixty-three members participated in a plant tour of the Rockwell Mfg. Co., where John Osberg, plant manager, spoke informally, outlining their operations and new developments.

Long Island

John H. Waddell, high-speed photographer and tool engineer with Fairchild Camera and Instrument Co., spoke at the Feb. 10 meeting at the Garden City Hotel. Election of officers followed.

TRENTON-DELAWARE VALLEY—Oscar T. Lippman, Brown & Sharpe Co., was speaker on "Applications of Screw Machine Tooling" at Feb. 14 technical meeting. Mr. Lippman has taught screw machine cam and tool design at the Rhode Island School of Design for 15 years. *C. H. Meyer*

Houston

On Feb. 11, at the Ben Milam Hotel. 170 members were present to hear J. L. Montgomery, Jr., sales manager for the Elox Corp., give a talk on precision measuring by electrical machinery methods.

Keystone

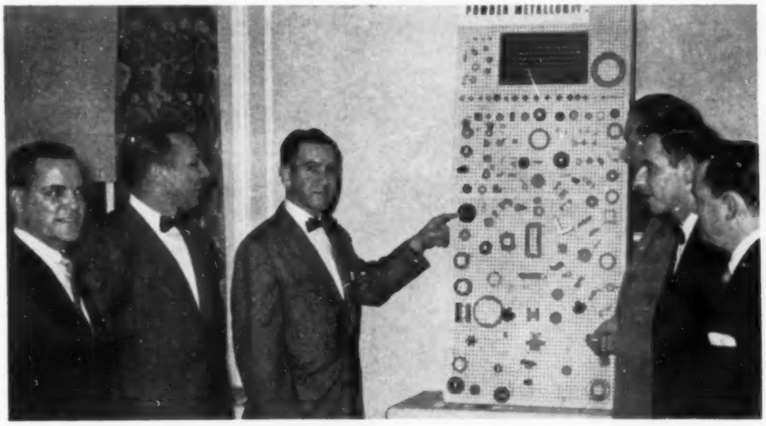
Some 120 members and guests participated in a plant tour of Scranton Defense plant, Eynon, Pa., Feb. 24. Don Rosie, industrial relations manager of the Newark Defense plant, Chrysler Corp., spoke briefly prior to the tour, outlining the background of the plant, production and methods.

Cedar Rapids

At the Feb. 13 meeting at Sheraton-Montrose Hotel, members heard Frank J. Boehm, manufacturer's representative, Devcon Corp., speak on plastic tooling, with a demonstration of actual-use plastics. Election of officers followed.

Kansas City

The monthly meeting was held at the Elks Club Lodge Feb. 19, where 75 members heard John E. Seidl, general supervisor of tool engineering of The Martin Co., as he showed a movie and charts on "Tooling for Guided Missiles and Rockets."



PHILADELPHIA—George G. Karian, manager, tabulating division of F. J. Stoker Corp., spoke on powder metallurgy to 75 members and guests at the monthly meeting. He cited low tool cost, close tolerances, low material waste and high-production rate, reduction of 10 to 15 percent in machining, and minimum of skilled labor, as among the advantages of powder metal parts. In picture above, Mr. Karian points out some fine points of such parts to a group at the meeting in Philadelphia's Engineers Club. *—John Chernokreluk*

Obituaries

Mitchell T. Arcy, Detroit, plant manager, Ace Tool & Machine Co.

Henry H. Boughner, Grand River Valley, president of Brant Engineering & Tool Co.

John A. Eustace, Syracuse, sales engineer with Frank M. Wilson Production Tools.

Gustave E. Goldstrom, Pittsburgh, sales engineer, National Twist Drill & Tool Co.

Charles B. Harbin, Atlanta, president and treasurer of Acme Machine and Diemakers, Inc.

Charles King, Pontiac, tool engineer, Pontiac Motors Div.

George William MacPherson, Northern Massachusetts, design engineer, Greenfield Tap & Die Co.

Kenneth C. Randall, former entertainment chairman of Syracuse, tool sales engineer, A. V. Wiggins Co., Inc.

William A. Valentine, Philadelphia, retired designer, Machine and Tool Design Co.

Ferdinand J. Young, South Bend, tool procurement supervisor, Bendix Products Div., Bendix Aviation.

Positions Wanted

TOOL AND DIE ESTIMATOR— Twenty-nine-year-old man with practical experience in shop as well as on drawing board, desires job in estimation and sales. Has knowledge of estimation. Is a graduate of Acme School of Tool and Die Engineering. Willing to relocate for the proper job. Write to: Box 113, News Dept., The Tool Engineer, 10700 Puritan Ave., Detroit 38, Mich.

CUTTING TOOL SALES ENGINEER— wants sales work with established company. Thoroughly educated in shop, design and sales procedures. Ten years of direct contact with customer on sales and service work for major manufacturers. Will travel. Write to: Box 115, News Dept., The Tool Engineer, 10700 Puritan Ave., Detroit 38, Mich.

PRESENT ENGINEERING-SUPERVISOR— age 55, college graduate, with 30 years' engineering background desires similar position or as plant-superintendent for medium-size metal-working company. Twenty years' experience as product and design-engineer (Universal-tool grinders, carbide-tool grinders, presses, lathes, special machinery, tools, jigs, fixtures and plastic tools). Ten years as works manager of machine tool manufacturing company in Europe. ASTE member, Michigan. Write to: Box 112, News Dept., The Tool Engineer, 10700 Puritan Ave., Detroit 38, Mich.

SPECIAL EVENTS

ASTE Tool Show and 26th Annual Meeting. May 1-8, Philadelphia. Show at Convention Center.

ASTE West Coast Tool Show. Sept. 29-Oct. 3, Los Angeles Shrine Exposition Hall.

Canadian On-Campus Conference. April 19, McMaster University, Hamilton, Ont.

Purdue On-Campus Conference. April 19, Purdue University, Lafayette, Ind.

Central New England Regional Conference. April 25, Providence, R. I.

CHAPTER MEETINGS

PLACE	Apr.	SPEAKER	SUBJECT
Buffalo-Niagara. Buffalo Trap & Field Club. 6:30 pm	10	Not announced	
Des Moines. Meredith Publishing Co. 6:30 pm	9	J. Stouffer	Plant tour, Meredith Publishing Co.
Elmira. Joe's Restaurant. 7 pm	7	G. E. Brumbach, Carpenter Steel Co.	Trouble Shooting on Tool Steels. Awards for drawing contest
Erie. Eagles' Club. 6:30 pm	1		Plant tour of Talon, Inc., Meadville
Fond du Lac. Bernward Hall. 6:30 pm	11	Dar Bingham, Giddings & Lewis Machine Tool Co.	Numerical Control as an Aid to Tool Engineers. Application of Numericord System
Greater New York. Hotel New Yorker	7		Surface Grinding. Plant tour. Tool Engineers' Day
Hendrick Hudson. Panetta's Restaurant. Menands, N.Y. 7 pm	16	Harry H. Gotberg, Colonial Broach & Machine Co.	Evolution of Broaching
Kansas City. Elks' Club. 7 pm	16	Leslie Seager, National Director, ASTE	Education of Tool Engineers
Keystone. Castle Restaurant. 7 pm	17	Not announced	Industrial Diamonds. Ladies night. Program—Bell Telephone Co.
Kokomo. American Legion. 6:30 pm	10	C. A. Sluhan, Master Chemical Corp.	Cutting and Grinding Techniques Relative to Fluids
Lansing. Rooms A-B-C, Lansing Civic Center. 7:30 pm	14	Dan Harrison, True Trace Sales	Hydraulic tracer controls
London-St. Thomas. The Country Esquire, St. Thomas. 7 pm	25	Not announced	Ladies night
Louisville. L. & N. YMCA. 6:30 pm	8	Asst. Sales Mgr. Nevar Zagar Tool Co.	Jig Design for Multiple Automatic Operation
Mansfield. Cleckner's on 30. 7 pm	24	C. G. Schelly, The DoAll Co	The Story of Measurement. Exhibit, Evolution of Tooling
Mississippi. Coronet Room, Edwards Hotel. 7 pm	7	Fred Burdett, Giddings & Lewis Machine Tool Co.	Numericord Equipment
Niagara District. Park Hotel. 7 pm	11		Ladies night
Northern Massachusetts. Greenfield, Mass. 7 pm	15	D. S. Gormley, Allegheny-Ludlum Co.	A User Looks at H. S. Steel. Joint meeting with ASM
Northwestern Pennsylvania. American Legion Home. 6:30 pm	3	Robert N. McGee, Jones & Laughlin Steel Corp.	Steel Manufacture
Ottawa Valley. National Museum. 8 pm	15	Edward M. Brockway, Bausch & Lomb	Optical Tooling
Portland, Me. Falmouth Hotel. 7 pm	4	Herbert Jahn, B. Jahn Mfg. Co.	Design and Construction of Dies, Jigs and Fixtures
Sacramento. Continental Baking Co. 7 pm	10		Plant tour
Saginaw Valley. Hi-Life Inn. 6:30 pm	17		Tour, Saginaw Malleable Iron plant
Santa Clara Valley. Sabellan's. 7 pm	15	Frank J. Lamphere, Charles Bruning Co.	Optical Tooling
St. Louis. Ruggeri's Restaurant. 6:30 pm	3	M. J. Delaney, Madison Faessler Tool Co.	Roller Burnishing as a Cost-Saving Means of Surface Finishing
Syracuse. Onandaga Hotel. 6:45 pm	8	Frank L. Engstrom, A. Schrader Sons	Pneumatics
Tri-Cities. Rock Island Lines, Silvis, Ill. 3 pm	9	K. O. Thomas, Rock Island Lines	Tour of railroad shops
Western Michigan. Varsity Grill. 7 pm	14	Four members	Talks on special tooling or processes in their plants
Worcester. Putnam & Thurston's. 7 pm	1	Harry Conn, Scully-Jones Co.	Optimation
Jackson. Clark Equipment Co. 8 pm	14		Plant tour, Clark Equipment Co.
Hamilton. Fischer's Hotel. 7 pm	11		Annual ladies night. Dinner and dance.
Grand River Valley. 8 pm	11	Stanley R. Cope, Acme School of Design Eng.	Deep Drawing. Plant tour, Page Hersey Tubes, Welland, Ont.
Windsor. Elmwood Casino 7 pm	11		Ladies night. Entertainment.

at Philadelphia

convention center

'58

ASTE TOOL SHOW

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'58 tooling for competition

Today, economical use of men, materials and machines can mean survival. Rising labor and material costs necessitate a constant search for new materials, equipment and methods. The forthcoming ASTE Tool Show in Philadelphia has for its theme, "Tooling for Competition." Many outstanding pieces of equipment are being shown to inform tool engineers of better ways to be competitive with more efficient equipment. The products discussed in the following pages indicate the magnitude and the types of equipment being displayed at the Show.

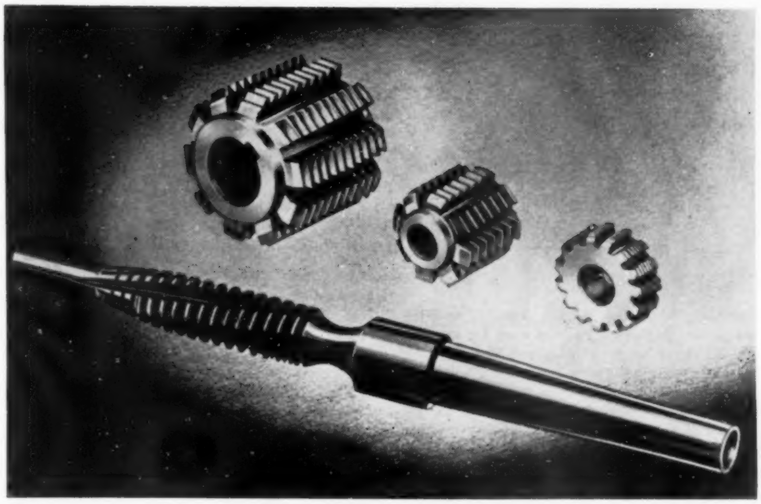
This "Show in Print" section highlights some of the new equipment and processes to be displayed at the ASTE Tool Show in Philadelphia, May 1-8. For those planning to attend the show, this information may be useful as a guide in planning time effectively. For those tool engineers unable to attend, this section will act as a report on the products being displayed. The exhibitors' names and their products being displayed are listed in the Directory following this section.

Tooling for competition starts with the basic cutting tools themselves. A major objective of cutting tool manufacturers has been to design tools that produce more finished work per hour. One answer is to develop tools capable of performing multiple operations with each pass. Detroit Reamer & Tool Co., for instance, has developed a number of rotary fluted tools to perform a combination of operations such as drill and counterbore, drill and ream, drill and chamfer, drill and countersink, and others. These tools are of high-speed steel or have carbide tips.

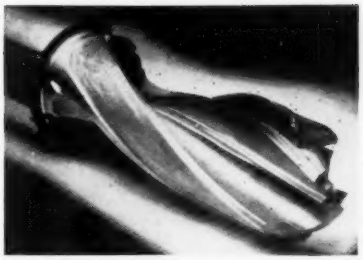
The necessity of double handling and two setups is also eliminated by a Custanite Corp. combination drilling and reaming tool. Illustrating some general trends in precision drill and reamer manufacture, this tool is ground from solid high-speed steel. Finished tolerances are held to ±0.0001 inch. Deep flutes insure proper chip removal.

An additional advantage of such multipurpose tools is that there is no need for separate spindles, heads or machines for each diameter. The traditional complex jigs with multiple bushings to guide each of the different single-diameter tools are also eliminated. At the same time, better concentricity, hole location and depth control are obtained.

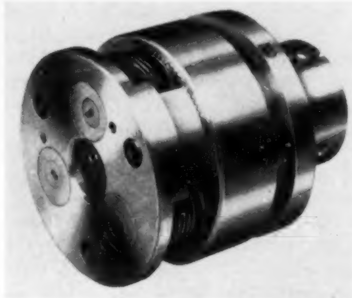
Mohawk Tools, Inc. manufactures size-optional subland drills in a wide range of nominal diameters and lengths as well as a full line of drill-reamers and subland piloted counterbores. The Spiral Step Tool Co. has also designed



High-precision fully ground gear hobs are of high-speed steel. These Eric R. Bachmann Co. tools are intended for use in the instrument and optical industries.



Multistep drill made by the Spiral Step Tool Co. makes it possible to drill a multidiameter hole in one operation. Holes are smooth and concentric. Need for two setups is eliminated.



Revolving thread rolling head of Landis Machine Co. has replaceable self-opening helix angle bushings.

a number of unusual rotary fluted tools. These drills are designed and manufactured in accordance with customer requirements. The drills are ground with a radial relief on margins to prevent binding during drilling operations.

Rolling, rather than tapping, internal threads is a production reality. The Besley-Welles Corp. X-Press tap cold-forms or swages the thread in ductile metals such as aluminum, zinc (including die castings), brass, copper, lead, leaded steels and the like. Internal thread rolling eliminates tap breakage caused by jamming or loading of chips. With no flutes of any kind, the tap is stronger than conventional fluted taps. This design feature is especially important in the smaller sizes where breakage, rather than wear, is the most significant factor in tap costs. With no cutting edges to become dull or worn, pitch diameters can be held close to "Not-Go" gage limits.

Rolled threads, as might be expected, are stronger than equivalent cut threads. Microphotographs of sections of cold-formed internal threads show that the grain lines are compressed or compacted and the material is made more dense. Pull and torque tests indicate that the rolled threads are from 15 to 20 percent stronger than cut threads.

Other advantages of internal thread rolling tools are long tap life and faster cycling time on automatic tappers and screw machines. The Besly taps have radial relief to reduce torque and permit free flow of lubricant. Standard tools No. 4 through 1/4 inch in NC, UNC, NF and UNF are provided with taper points to facilitate starting. They are available in two and four threads of taper for bottoming and through holes, respectively. Machine screw sizes, zero to 3, have radial relief only.

A wide variety of inner diameter cutting tools for boring, reaming, bottoming and multiple cutting are produced by Madison Industries, Inc. Madison cutters have a number of interesting features that exemplify the trend toward greater productivity through better tool design. Faster tool changes are possible because the cutters are pre-sized and uniform and can be changed without removing the boring bar from the machine. Once an adjusting screw and a lock screw have been loosened, the cutter can be slipped from the bar. Tightening the two screws locks the new cutter in place on the bar. The tools have only two cutting edges, providing ample chip clearance and free circulation of coolant. The possibility of off-center adjustment is eliminated, since both cutter blades are adjusted by one micrometer screw.

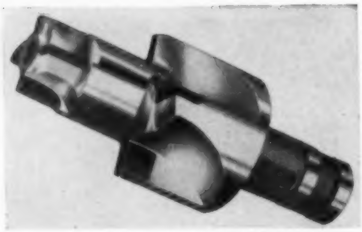
Deburring of tapped holes is often a second operation and several efforts have been made to combine tapping and deburring operations. An interesting solution to this problem is the Burr-Bit produced by Vernon Devices, Inc. This device, which can be fitted onto any standard two or four-fluted tap, chamfers the hole while the tap is being withdrawn from the workpiece. The high-speed steel bit is suitable for deburring most materials, including cast iron, steel, aluminum, brass, copper and plastics.

Most tapping operations on screw machines consist of blind hole tapping, with little clearance at the bottom of the hole. A spiral-fluted stub tap designed by the Jarvis Corp. has several features that contribute to more accurate tapping and longer tap life. The section immediately behind the threads, for instance, is necked down to below the root diameter. This "necking" provides more chip room, reduces drag and facilitates application of cutting oil or coolant to the cutting edges.

The taps are extremely strong because of their short threaded section and short over-all length. The combination of length of thread and length of necked shank is equal to the thread length on equivalent standard taps.

Buying drills in sets has advantages in many shops, particularly when they are conveniently packaged. Three taper length drill sets are made by Ace Drill Corp. The sets include taper length drills in fractional, wire and letter sizes, packaged in compact folding metal index cases.

Many improvements in production are made through the adoption of highly specialized tools and tooling. An example is the cluster tooling developed by DeVlieg Microbore Div. of DeVlieg Machine Co. This type of tooling makes the turret lathe, already one of the most versatile machine tools, even more versatile by combining several operations. Turret lathes are normally equipped with five turret stations and, when conventional general-purpose tooling is used in each of these turret stations, the number of stations is usually insufficient to completely machine each side of the workpiece. The workpiece must be handled in and out of the machine several times to complete all



Barber-Colman Co. Mult-O-Tool combines operations in single cut.

operations. With cluster tooling, these operations can be combined with consequent better utilization of operator and machine time.

Such special tooling is often designed by the tool manufacturer, freeing plant tool engineers for other problems. The Microbore Div. maintains a proposal engineering department to assist users in the design of special cluster tooling—a service which is now being offered by many other manufacturers of special tooling.

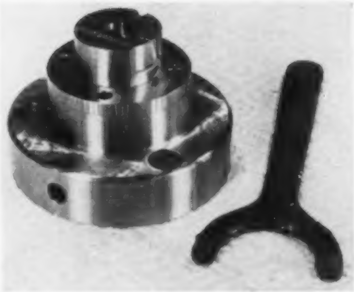
For high-production boring operations, solid-carbide tools are often the best choice. Solid-carbide head tools for boring and bottoming, as well as facing, are furnished by Bokum Tool Co., Inc. These tools, which are available in standard and extra-long lengths, plus a short-neck series, provide a full 210 deg of life. Bokum also has a complete line of swing tool holders for automatic screw machines, turret lathes and multispindle machines.

Indexable throw-away inserts have obvious advantages. Such inserts are used on the Kendex boring bars produced by Kennametal, Inc. These bars, which are made in two general styles with eight sizes in each style, are encased in carbide. Because of the high modulus of elasticity of carbides, deflection and chatter on precision boring operations are minimized. Tests show that the ratio of rigidity of the encased bars, as compared to steel bars, is 2.6 to 1.0.

Style KA has a triangular positive-rake insert, without a lead angle, for boring to a shoulder. Style KB, with a square positive-rake insert, has a 15-deg lead angle for straight-through boring operations.

Reduction of tool inventory is a continuing problem for many manufacturers who do not wish to tie up large sums of money in an extensive tool inventory, yet cannot afford the production delays encountered when needed tools are not on hand.

Use of adjustable tools is one answer to this problem. Madison Industries, Inc. provides adjustable rough boring tools and reamers in kit form. The adjustability of these tools eliminates the necessity of grinding the tools to size for a specific application. Size range of the boring tools, which utilize high-speed steel cutters, is from 1 to 2 inches. There are two adjustable reamer kits: one for the ⅝ to 1-inch size range, the other for the 1 to 2-inch size range. The reamers have a floating cutter action to automatically compensate for minor machine misalignment.



Cutting tools in small boring heads made by Briney Mfg. Co. can be quickly adjusted with a spanner wrench.

Gun type drills can be described as straight-flute, self-piloted deep-hole drills. These drills can produce finished holes of close tolerance in one operation, eliminating reaming and honing in most cases.

It has been determined that gun type drills can be rotated, rather than rotating the work, as has been the case in the past. The results obtained are fully as good as the old method. This allows an almost unlimited selection of work and greater flexibility in drilling speed selection.

Since gun type drills operate at higher speeds and lower speeds than twist drills, they can be used for drilling materials such as the new superalloys and heat-treated materials. Gun type drills have been developed to exploit the potential benefits of gun drilling to the maximum. Madison Industries, Inc. also manufacturers a line of gun type reamers. Both the drills and the reamers have replaceable heads that can be removed for sharpening without disturbing the machine setup.

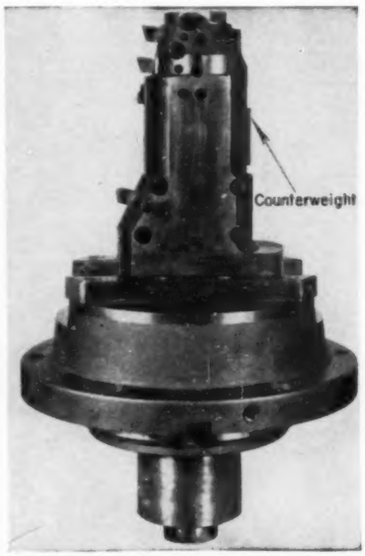
As hole tolerances are reduced, it has been necessary to incorporate extra manufacturing operations to generate the required roundness and concentricity. By broaching holes, however, it is possible to finish holes to exact size in one pass. The duMont Corp. furnishes round broaches in 13 sizes. These broaches can be used in arbor or hydraulic presses. Broached holes are straight all the way through.

Rolling of external threads, while not a new process, is finding an increasing number of applications as new thread rolling tooling is developed. Landis Machine Co., for instance, has developed several self-opening thread rolling heads that can be operated at high speeds and are thus adaptable to carbide tooling. The Landis stationary head is designed for turret lathes, hand screw machines and automatic screw machines employing a stationary type head. A Landis revolving head is intended for automatic screw machines employing a revolving head. Both types of heads can be supplied for use on threading, drilling and tapping machines.

Replaceable helix angle bushings are an important feature of these heads. One set of standard bushings can roll both UNF and UNC threads. The helix angle established for this standard bushing set is a "mean" angle suitable for rolling all diameters and pitches within the range of the head. When an exact helix is required, the proper helix angle bushing can be substituted for the standard bushing. Thus, the need to secure a special head is eliminated.

Changes in diameter are accomplished by substituting the proper rolls for the diameter and pitch to be rolled. Fine plus or minus adjustments in pitch diameter can be made by loosening and tightening two opposed setscrews in an adjusting ring. The rolls are designed so that they can be reversed and both ends used.

Milling cutters are, along with drills and turning tools, perhaps the most commonly used metal cutting tools in industry. The trend toward designing tools capable of performing multiple operations, already noted for drilling tools, is also found in milling tools. Barber-Colman Co. has designed a complete line of Mult-O-Tools for high-



Special cutter head, developed by Gairing Tool Co., is used for cutting operations on aluminum transmission cases.

production, transfer type machines. Interchangeability of blades minimizes the number of blade sizes necessary. Standard carbide blades are incorporated wherever possible and help to hold blade costs down. Conventional sharpening methods are used for all of these multiple tools.

Carbide-tipped milling cutters, as well as inserted-carbide types, are furnished by the Eclipse Counterbore Co. Other products of this company are precision end mills, high-speed cutters, back spotfacers, core drills and multidiameter cutters.

Wedge type high-speed steel cutters are part of the line of the O.K. Tool Co. The blades are held in place by adjustable wedges and locked by a device that permits adjustments for wear to be made without difficulty. The line includes staggered tooth mills, half-side mills, integral-shank end mills, shell end mills and face mills. Special O.K. end mills for cutting aluminum are of high-speed steel and have two flutes. Owing to high spiral and polished flutes, these mills produce a fine finish on aluminum and other nonferrous workpieces.

Several milling cutter manufacturers have expanded the number of types and sizes of cutters available as "off-the-shelf" items. This has lessened procurement times for users, making it possible to specify "standard" tools for a greater number of applications. The Cutting Tool Div. of the Brown & Sharpe Mfg. Co., for instance, manufactures more than 3200 "standard" tools, including 60-deg angular cutters, shank type corner-rounding end mills, fluted end mills and stagger-tooth side milling cutters.

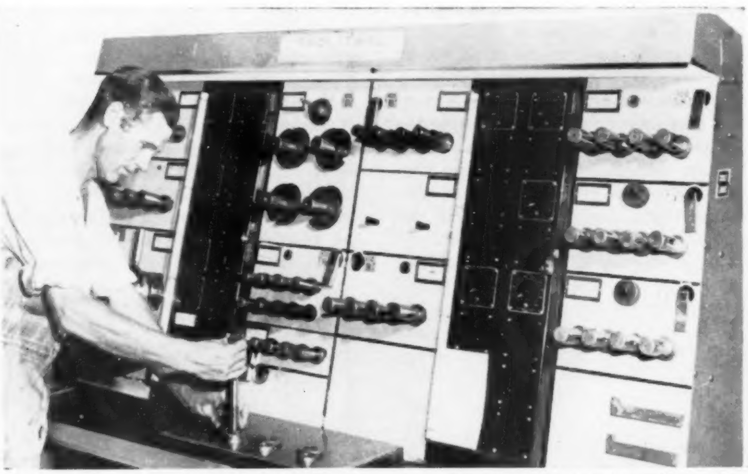
Several cutters produced by the Lovejoy Tool Co. Inc. are of new design. One of these cutters, featuring a high positive axial rake and a negative radial rake, give superior feeds and speeds with high-speed steel blades.

The chip breaker end mills of Malcus Tool Corp. are intended for work where maximum stock removal is required, especially tool and die work. These mills have spiral flutes and serrated lands. When the mills are fed into the workpiece, new cutting edges (the serrations) are constantly appearing, producing a fine powder, rather than stringy chips. The mills can be run at high feeds and speeds with less vibration than conventional mills.

An offset boring head made by Beaver Tool and Eng. Corp. is compact, with a minimum of component parts. A built-in adjustable wedge compensates for wear on the tool carrier slide, insuring long life for the boring head. Also the whistle notch design used for locking the tool carrier slide eliminates any change in the tool setting. A large dial facilitates setting, permitting direct-reading adjustment to 0.00025 inch.

There are two tool mounting holes for straight-shank tools in the tool carrier slide, accommodating (with adapter bushings) shanks up to $\frac{1}{2}$-inch diameter. The boring range is from $\frac{1}{16}$ to $3\frac{5}{16}$ inches. This Calibore head is easily adapted to Beaver quick-change holders and also to machines which have conventional tapered spindles.

New designs of small boring heads, introduced by Briney Mfg. Co. can be adjusted to 0.0001 inch without loosening or tightening screws. These heads have small outside diameters, making it possible to group several heads together, maintaining close center distances. The boring tools used are usually of the standard solid carbide or carbide-tipped replaceable-bar type.



Tool usage is coordinated and down time is reduced at the Ford Sterling plant by use of Scully-Jones Toolitrol system. Tools are stored adjacent to the three transfer machines they serve. Counters are set for optimum tool life and signal operator when tool changes are required. Gages and presetting tools, as well as the tools themselves, are stored at the control board.

Modern Mfg. Co., Inc., has developed boring bars from $\frac{1}{2}$ to 4 inches in diameter. Cutting tools have either a 53 or a 90-deg angle. A micrometer adjustment facilitates setting the tool bit. The bar is graduated, showing the depth of boring in quarter-inch increments.

A twist of the Davis Kwik-Size boring head—after loosening the locknut—puts a preset cutter in position to start the next operation. In a matter of seconds, this tooling dials from roughing to semi-finish to finishing cutters without disturbing the work setup or removing the arbor from the machine spindle. Each successive cutter is set to exact size in the toolroom and is held rigidly in correct position on the eccentric arbor by a locating slot in the boring head, which engages the arbor drive key. Numbered positions make changing operations fast and foolproof. Other Davis products include stub boring tool sets, boring bars and interchangeable block type tooling for boring.

Wickman-Brown floating reamers have fully supported floating blades that can be supplied in high-speed steel or carbide. These reamers can be set to size while they are in the machine, since they are equipped with a micrometer adjustment. Twenty-three individual models cover a range of sizes from $\frac{1}{2}$ to 8 inches.

A shaving tool developed by Jersey Mfg. Co. has a floating action and will hold tolerances of ± 0.00025 inch. It will fit the standard circular form toolholder or the back slide on a Brown & Sharpe automatic screw machine and, with slight modification, can be used on other automatic screw machines, hand screw machines and shavers. A standard model supports the roll on both sides, making it ideal for long runs and ordinary forms. A special model supports the roll on one side only. It is used for shaving forms that have unusual variations in diameters.

Milling cutters developed by McCrosky Tool Corp. are intended for milling with throwaway carbide inserts. The bodies of these new cutters are made in two parts so that all bearing surfaces can be precision ground. This assures extremely accurate positioning of the

carbide inserts in the body and eliminates the need for ring gages or setting fixtures. The two parts are asesmbled in the factory. An ordinary hexagonal wrench is used to lock and unlock the inserts.

When performing intricate machining operations, special cutter heads are often advisable, particularly in automated setups. One such special head has been developed by Gairing Tool Co. for performing cross facing, grooving and undercutting operations on an aluminum transmission case. The overall size of the tool is 16 x 24 inches.

The head is designed so that when the tool block feeds out, a counterweight feeds out in the opposite direction to counterbalance the tool block. The main head is attached to the spindle of one of the machine units. The entire unit moves forward to a positive stop and an auxiliary cylinder in the back of the unit then creates the actuating motion. Actuation is accomplished by an inner spindle attached to an auxiliary cylinder and is initiated through a mechanical yoke, or bell crank.

During the past year, several cutting-tool materials have been introduced. Vascoloy-Ramet has developed two new grades of steel-cutting carbides: V-R 73 and V-R 77. The former is intended to produce maximum results for applications in the minimum shock range, and has high resistance to cratering and edge wear. V-R 77 is for applications where high resistance to mechanical shock is desirable. These new materials are stocked as "standards" in full length and throwaway inserts, most blank styles and the popular sizes of standard brazed tools.

Kennametal boring bar is encased in carbide to minimize deflection on precision boring operations.

Besly-Welles carbide throwaway inserts are now lapped, providing highly polished surfaces. Two of these inserts can be easily wrung together, a condition which only accurately processed surfaces can achieve. This feature gives greater tool life per cutting edge with less chipping and breakage.

Throwaway inserts produced by Adamas Carbide Corp. are packaged in plastic. There are ten triangular, square or round throwaway inserts in each package. The clear plastic packaging protects the tools and also simplifies inventory control.

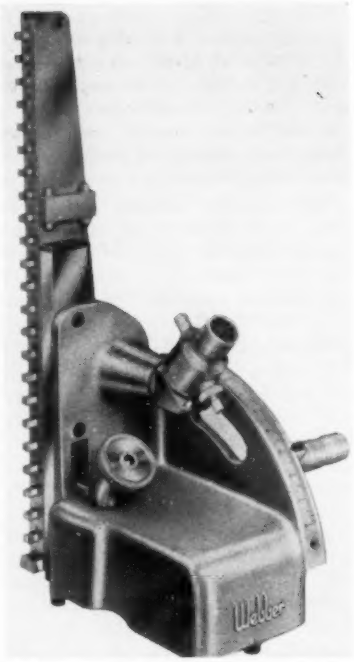
Cemented-oxide tools are starting to come into their own for production applications. Carboloy grade 0-30 cemented oxides are stocked in the form of square, triangular and round throwaway inserts and as solid boring tool blanks. The inserts are designed for use on nearly all standard cutting toolholders.

In one Carboloy test, grade 0-30 cemented oxide tools were used to machine AISI 52100 steel, 60 to 62 R_C, at 600 fpm. This is about six times faster than is possible with carbide tooling. In the past, most materials in this hardness range have been ground to shape.

Inspection and Measurements

New hand tools and precision instruments for inspection and measuring make the workman's job easier to perform with greater precision and with less fatigue. Starrett's 6-inch satin chrome master vernier caliper is a miniature of its 12 and 24-inch sizes. Fifty-division vernier scales have widely spaced easy-to-read graduations. Flush fittings of the vernier to the main scale eliminates errors caused by parallax. Starrett's new micrometer head has a 1-inch range and reads directly to 0.0001 inch. Its new constant-pressure nut makes possible a wide range of tension adjustments from light to heavy as required. Also, Starrett's measuring rods are designed for use with jig borers and other machine tools where spacings and table settings must be held to a high degree of precision.

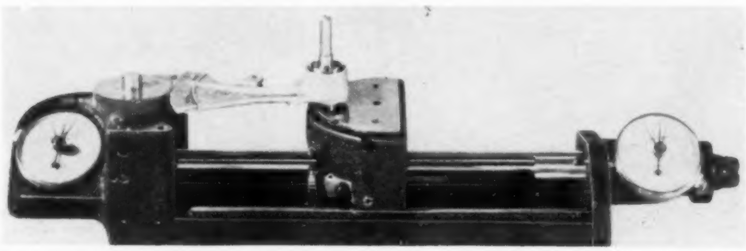
Height gage, distributed by the Foster Supplies Co. has a positive indexing action of 0.500-inch intervals located by hardened steel balls set in a stainless steel column. Intermediate settings on the new Microball height gage are made by operating a micrometer gage incorporated into the design. The gage is easy to read within a tolerance of 0.005 inch and eliminates the more difficult-to-read vernier scale.



Webber optical height gage employs gage blocks and a microscope.

Also, Lufkin has developed a new micrometer having disk anvils for places inaccessible to ordinary micrometers. It is useful for measuring gear teeth, forming tools and dies. It measures to a depth of $\frac{1}{8}$ inch on forms having grooves wider than 0.015 inch.

For measuring and checking the depths of internal O-ring, retaining ring and recess grooves, the Imp micrometer built by Ilinois Metal Products is efficient and accurate. The frame has a deep throat allowing for the measurement of internal grooves 2 inches from the face. Interchangeable



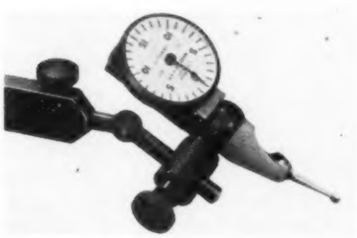
Lightweight feature of Bedford indicating gage makes it useful at machine.

anvils are shaped to fit within the groove and are available in widths up to 0.230 inch. A standard Lufkin micrometer head is assembled on the frame.

Highly precise scales subdivided throughout their entire length into intervals of 0.001 inch are useful on milling machines, jig borers, and grinders. With a vernier scale on the eyepiece of a simple microscope, the scale can be read with repeatability to 0.000030 inch. Developed by Micro-Line Inc., the scale is independent and is not in direct contact with the work. It has no backlash and can never wear out. For precise work where thermal expansion is troublesome, the scale can be furnished on the identical material that is being worked.

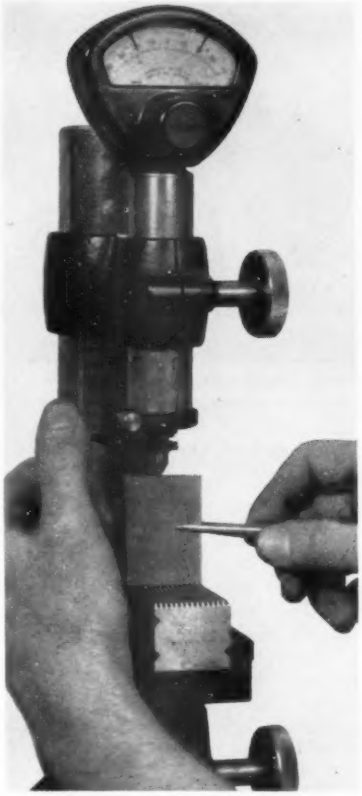
Dial Instruments and Fixtures: No switches or latches are required to reverse the direction of operation of the two-way dial test indicator made by Lufkin Rule Co. Pressure from either direction on the contact point causes the pointer to move in a clockwise direction. High spots are always read to the right of zero. Having a jeweled movement, the indicator has a range of 0.030 inch, graduated to 0.001 inch.

Controlled contact pressure on indicating gages manufactured by Bedford Gear and Products, Inc. assures duplication at each repeat setup. Ball bearings are used at all moving parts and instrument is light enough for location at the machine. The comparator and accessories make possible a wide range of measurements. For gears it makes a total composite check to determine runout. Also, circular pitch spacing, tooth thickness variation, profile error, lateral runout and pin measurement are easily checked.



Lufkin two-way dial indicator always measures high spots with a clockwise rotation of indicator.

Completely shockproof dial indicators designed by Petz-Emery Inc. have virtually indestructible gearing mechanism which guarantees long life and low maintenance. The units are simple in construction, reduce servicing problems and eliminate the need for a large inventory of spare parts. Of 31 total parts, 26 are common to all indicators. With six ranges, the dials are graduated in 0.001, 0.0005, 0.00025, or 0.0001 inch. One model, the 0.00005-inch indicator is accurate to 0.00001 inch. To facilitate maintenance, self-inventory service kits have been designed for the indicators.



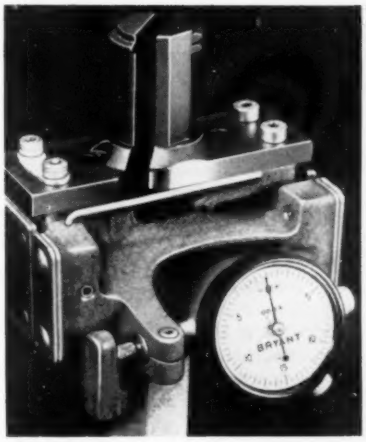
Mikrokator Johansson Gage indicator measures within 0.000001 inch with measuring pressure from 1 to 40 oz.

Four extensions enlarge the range of Boice Gages Inc. bore gages to measure from 0.084 to 0.125 inch. This gage when added to the basic Tri-o-set will cover the range of 0.084 to 1.000 inch with four gages and fifteen extensions.

Gages and comparators designed by Johnson Gage Co. for checking both internal and external screw threads have attachments and accessories for checking the concentricity and squareness of related surfaces. Exacting requirements for checking turbine blade dovetails and serrations have resulted in the development of a complete line of new comparators for this vital inspection task.

Indicating gages built by Sealol Corp. were designed for economy, flexibility and high fidelity. For example, all IE gages measure either ID or OD, as will their matching set masters. Snap gages mount on special stands and measuring pins can be set to measure to any depth to 2 inches.

Small diameter holes, from 0.057 to 0.828 inch, can be measured accurately to a depth of 3⅛ inches without the use of extension rods when using the Diatest high-precision bore gages. The measuring units are made of highly tempered, hard chromium-plated steel of the split ball type. When not in use, the split ball unit opens to the maximum size. When being used, this split ball is pressed together and forces a taper needle upward to operate a dial indicator for continuous readings. The unit, called Diatest and distributed by Foster Supplies Co., is easily operated by unskilled workers. It is useful for measurements within 0.0004 inch, out-of-round conditions, tapered or barrel-shaped bores, incomplete bores or with other bore crosswire interfering.



Bryant thread gage checks the ability of parts to assemble and to function.

The AA Gage Co. build an inspection tool called the Cylinder Square. For checking concentricity, squareness, runout, etc., it has powerful magnets securely embedded in the face of the square to hold it to the surface of the part being checked. Face of the tool is square with the cylinder within 0.000050 inch.

As many as ten dimensional checks can be made with one handling of the four-post Econocheck fixture made by William L. Riggs Co. The standard components this fixture include V-blocks, flat angles, parallels, 90-deg. angles and platens. These fixtures provide solutions for awkward dimensional checks. The fixtures are adjustable and setups can be made quickly even for short runs. These units can accommodate diameters up to 6 inches.

Low-cost split-plug type thread segments for checking pitch diameter of internally threaded parts facilitate checking internal threads with Bryant Gage Div's thread gage. The segments can be mounted on Bryant indicator comparators and are made to engage a single thread. This is accomplished with one thread on one segment and two threads, with relieved outer flanges,

on the other segment. The major diameter is truncated one-quarter pitch. This simulates the conventional three-wire measurement of external threads.

In addition to its line of dial gages and indicators, B. C. Ames Co. has developed an angularity gage that solves the difficult problem of measuring angles on compound curves such as those on turbine blades. Direct readings are obtainable to check against a master. This results in faster, more accurate measurement of pieces that normally require many hours of checking. Also, Ames' long-range indicators embody several improvements. These indicators will provide more accurate measurements than before.

The Hemco process chrome-plates wear surfaces of gages and other tools without the normal irregularities previously associated with chrome. The process makes it possible to finish plate to size without grinding or lapping after plating. Chrome deposit on H. E. Morse Co. gages averages 0.0007 inch, increasing wear life as much as eight times that for steel gages.

A mechanical indicator, called Mikrokator and distributed by C. E. Johansson Gage Co., is graduated in 0.000001 inch and has selective measuring pressures from 1 to 40 oz. Mechanical design eliminates lag and backlash and insures positive, dependable repeat readings.

A fast and accurate method of measuring pitch diameters employs the screw thread comparator developed by O-Vee Gauge Co. It uses the three-wire measuring principle. Setting is accomplished by the use of gage blocks, eliminating the need for costly set plugs. Variations in size can be observed on the indicator which is equipped with tolerance pointers.

A new system for measuring internal diameters without resorting to gage blocks, ring gages or other standards has been developed by Sunnen Service Corp. The combination of a setting fixture and PG-800 gage provides a measuring machine capable of accuracies within 0.000020 inch.

Ames angularity gage saves hours in checking angles on compound curves.

Granite Plates: Troubles experienced by seizure of gage blocks and checking fixtures on surface plates have been solved by Collins Microflat Co. They have developed a process of lapping black-granite plates to provide a continuous bearing surface interspersed with micronic valleys. These minute reliefs, formed by the lapping procedure, afford sufficient air-pocket relief between bearing surfaces to prevent seizure. These subdivisions are invisible, the lapping effecting a finish between 3 and 16 microinches, rms.

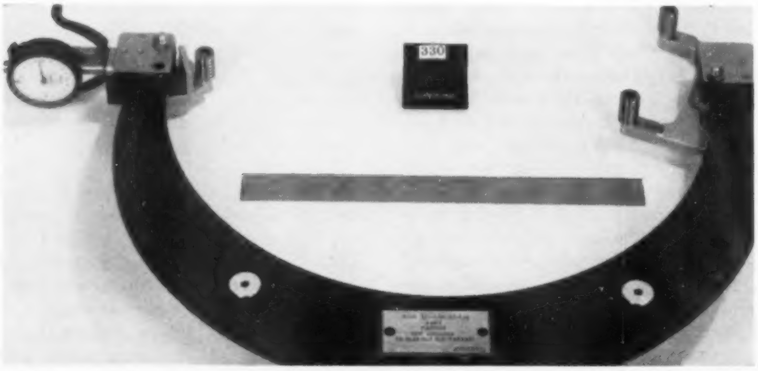
Boice Gages' line of surface plates are black diabase granite and are checked both mechanically and optically for flatness. The granite is mined in Pennsylvania and has excellent properties for the plates. Granite riser blocks are made by The Herman Stone Co. to eliminate erroneous readings caused by vibrations of extra-length height gages through the use of these blocks and standard gages. The blocks are easily positioned because they float on a thin air film while being positioned.

For checking the accuracy of surface plates, Rahn Granite Surface Plate Co. has developed a Planekator instrument. The method is simple and calibrates surface plates within 0.000010 inch.

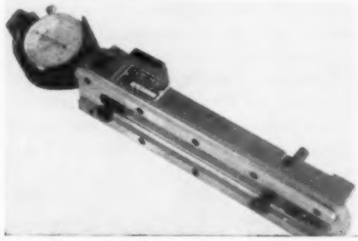
O-Vee thread comparator is set with gage blocks.

Gage Blocks: Optical height gage developed by Webber Gage Co. permits fast measurements of heights up to 61 inches within accuracies of 0.000005 inch per inch of height. Combining Webber gage blocks and a Leitz measuring microscope, the gage gives speedy, easy, accurate surface-plate transfer of measurements. Basically, the gage is a stack of gage blocks held by spring tension. The stack is made by alternating 0.3000 and 0.7000-inch blocks with alternate blocks protruding to make inch measurements.

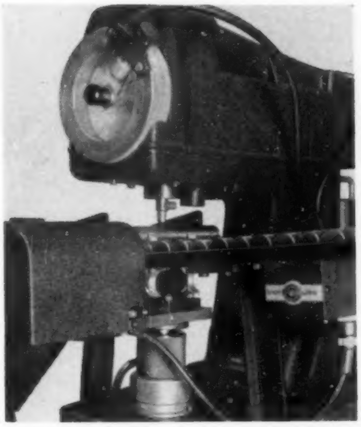
A lever-operated cam and a vernier adjustment handwheel raises or lowers the stack of blocks. Settings are read in the optical eyepiece from the top of the protruding gage block corresponding to the inch setting of the instrument. This gage eliminates slow tedious wringing of the blocks. It also eliminates the inaccuracies of micrometer screws. Because the blocks are never handled, measurements are at room temperature.



Johnson hand type comparator for large external threads, 1½ to 20 inches pitch.



Features of Sealol Acra-Ment gages are rotating dial indicator and ability to measure either OD or ID.



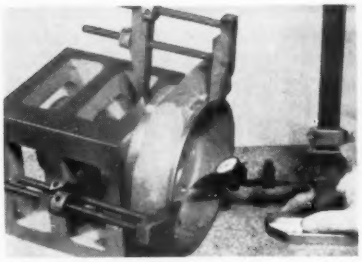
Automatic hardness tester by Wilson Mechanical Instrument Div. is capable of conducting 1000 tests per hour.

Surface Measurement Instruments: A permanent magnified chart record of the shape, height and spacing of surface irregularities, including long waves, bows and nonsymmetric profiles, such as steps, plateaus, peaks and grooves, is obtained with the Proficorder designed by Micrometrical Co. It produces a pen-drawn chart of the surface giving microinch variations in accurately readable form.

Flatness of surfaces which are reflective can be tested rapidly and accurately with the Van Keuren Reflex interference viewer. Increased accuracy is built into the device by eliminating errors of too-close and off-axis viewing. Due to the design of its optical system, an exceptionally bright field is produced with coated optical flats. The principal feature is a black, narrow, sharp-edged quality of the dark band which has a width corresponding to a height difference of 0.000001 inch, permitting great precision as well as readability.

A multiple-beam interference microscope, called Multimi and distributed by the C. E. Johansson Gage Co., is useful for both scientific and practical surface measurement. Accuracy of the instrument is 0.04 microinch. Fringes are replaced by hairlines exactly revealing surface shapes. In addition to surface-finish measurements, it is useful for determining surface finish on frequency crystals, thickness of films and coatings, and thermal and mechanical deformations.

Electronic and Pneumatic Gages: New electronic gage head responds to a tip pressure of one-sixth oz. Called the Feathertouch gage head, the ultrasensitive pickup is used with an amplifier to make measurements on small, thin or highly polished metal and nonmetal parts and surfaces that would be distorted or marred by heavier gaging



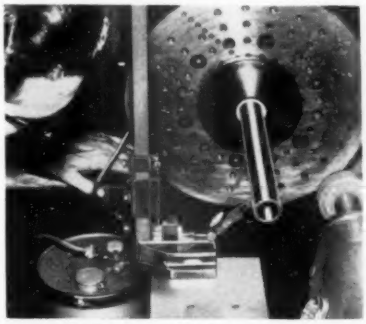
Machined casting clamped to Taft-Peirce box angle iron for inspection.

pressure. The ball tip gaging stylus can be used to check under, as well as over, surfaces and to explore bores 1/8-inch diameter or larger.

Designed by Sheffield Corp., the gage also has a selective gaging pressure of 1¼ oz and can be reversed to check under surfaces with the one-sixth-oz pressure. The amplifier indicates stylus movement by means of two-range electronic amplification of 5.000/10.000 to 1. With the higher amplification readings are graduated in 0.000010 inch over the full scale range of 0.0004 inch.

Sheffield's electronic hole checker measures bore for size and taper down to 0.043 and up to 1⅜ inch. The gage also detects bellmouth, hourglass and out-of-round conditions. Its precision requires use under controlled conditions. Master ring gages, precision parts, internal grooves and ball races can be inspected on the instrument. The gage has but one gaging contact that has a vertical adjustment up to one inch. Gaging pressure is less than 3 grams. Gaging information is picked up from the reed mounted stylus by an Electrojet gage cartridge and transmitted to an electronic amplifier.

Also, a Centerfind gage has been developed by Sheffield for hole location or centering on a jig borer or grinder. Pickup stylus is connected to a column Precisionaire air gage. As the spindle with the stylus rotates, the gage reading fluctuates until the hole is centered. Another interesting Sheffield develop-

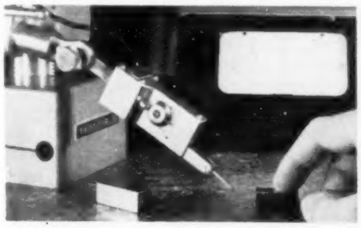


Magnetic base in AA Gage Co. cylinder square reduces setup time and distortion caused by clamps.

ment is an air gage that checks internal bores within a 24 to 36-inch range.

Moore Products Co. has developed improvements in its pneumatic comparator gaging equipment including units for multiple machine inspection and automatic grinding control. For manual gaging applications, a compact gage is adjustable for amplifications up to 0.0004 inch full scale. The stand has a 4½-inch indicator with dead-heat action and cushioned return.

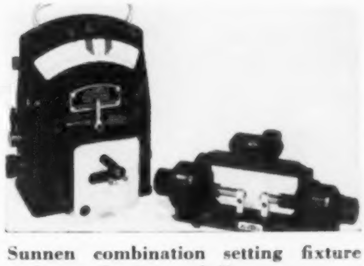
The Taft-Peirce Mfg. Co. Versachek is another electronically operated gage that converts minute dimensional changes to voltage changes and amplifies them to read on a large meter with



Sheffield Feathertouch gage head is sensitive to one-sixth-oz pressure.

widely spaced graduations. Gaging is based on a comparison of product dimensions to those of gage blocks or other suitable masters. Four ranges of magnifications may be used from 400:1 to 20,000:1 with graduations from 0.0005 to 0.00001 inch. To protect the operator from reading the wrong scale a red pilot on the meter face indicated the graduations in use.

A new concept in precision checking of concentricity, roundness and squareness involves a gage designed by Cleveland Instrument Co. It has a rotating table mounted on an ultraprecision spindle with one or more electronic indicators scanning the part. Measurements are plotted on a polar coordinate



Sunnen combination setting fixture and gage for internal diameters.

chart recorder, synchronized with the rotation of the spindle. Error caused by spindle runout is less than 0.000003 inch. By rotating the part instead of the gage, it is possible to refer the concentricity and roundness of several diameters to each other simultaneously.

Also developed by Cleveland Instrument is an electronic work positioner for locating or measuring work position on a jig borer or other tools with rotating spindles. With the gage head mounted on the machine spindle measurements within a few millionths inch are possible on inside or outside diameters from $\frac{1}{16}$ to 10 inches.

Hardness Testers: Innovations in equipment and quality control techniques for determining the hardness of materials facilitate testing and provide more dependable readings. The combination normal and superficial unit of Wilson Mechanical Instrument Div. is suitable for laboratory or production work. The company's automatic feed and discharge unit is capable of testing 1000 parts per hour.

Newage Industries Inc. has developed a new portable hardness tester that can be pressed onto any surface or shape to secure a direct hardness reading corresponding to Brinell or Rockwell scales. Incoming material may be checked on the truck; materials being machined can be tested without removing; sheets can be checked without cutting and rod can be checked in the rack.

Another portable hardness tester is built by King Tester Corp. It has unlimited capacity to test large specimens. A chain adapter is adjustable to the size of the piece being tested. High-strength chrome-moly steel arms hold the chain to the test head, allowing the head to remain rigid while the chain takes the full thrust of the load. Offset testers and special forms are available for checking gears, pulley grooves, etc.

Components and Accessories: To meet the demand for an intermediate size precision setup and inspection tool, Taft-Peirce has built a $3\frac{7}{8}$-inch capacity V-block having a reversible swing clamp capable of holding stock as small as $\frac{1}{2}$ inch. The Taft-Peirce 20-inch sine block is especially developed for measuring large angular work. It is heavily proportioned and precision ground on all working faces. Tolerances are within a few tenths. Work is easily clamped by using tapped holes which are on all working surfaces. Also, box angle irons and pallet angle irons have precision surfaces and are convenient for work clamping.

Magnesium plate equipment for the assembly of tooling bridges, consisting of angles, risers, box sections and plate, saves 30 percent in time over conventional assemblies. Built by The Challenge Machinery Co., the components have T-slots on 5-inch centers to facilitate assembly and adjustments.

Tapered-needle, direct-reading hole gages, developed by Hamilton Watch Co., adjust instantly to any diameter in the range from 0.025 to 0.380 inch. Measuring in increments of 0.001 inch, these gages can be interpolated to the nearest 0.0005 inch, locking at the precise diameter reading. The new Model C is designed to measure holes with countersinks or chamfers.

To make economical plug and ring gages, Huron Machine Products Inc. manufactures a line of gage handles, blanks and accessories that can be made into finished gages quickly. All handles and blanks are American Gage Design Standard. The gage blanks are hardened and ready for finish grinding and lapping.

Precision balls used in the fabrication of tools are accurately ground by Carr Lane Mfg. Co. so that the ball and the cylindrical shank are concentric. This allows the construction ball to be accurately located on the tool. Measurements can be taken with a gage or micrometer in any direction from a point which is the center of the ball. Also, construction balls allow a locator to be positioned on a given line or plane in a fixture.

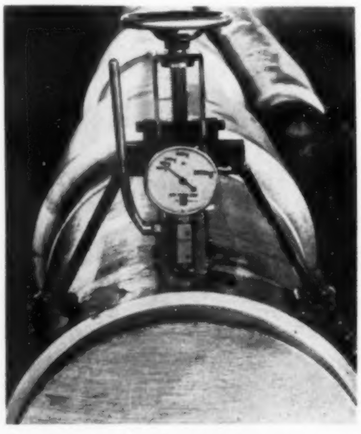
Colonial Mfg. Co. gages are adjustable and can be locked rigidly and sealed. The flush pin gage is made in such a manner that the checking dimensions can be adjusted and set and, in addition, can be relocated in relation to the body. The chamfer gage eliminates the necessity of using any pins or rolls to set the gage to its required dimension. A constant is used to add or subtract from the dimension to be checked, thereby making it possible to set this gage with either a set of jo-blocks or micrometer.

Standardized gage components for both indicating and flush pin types minimize gage design time and reduce gage building costs. A. G. Davis Gage and Eng. Co. makes such components to meet the need that has existed in the field of special gage design. These components eliminate the costly repetitious designing and detailing of many gaging functions and free the designer for more creative work. Many special hardened and ground details formerly required in special gages can be eliminated. Further economy is realized by salvaging the standard components from obsoleted gaging and reusing them on future designs of checking equipment.

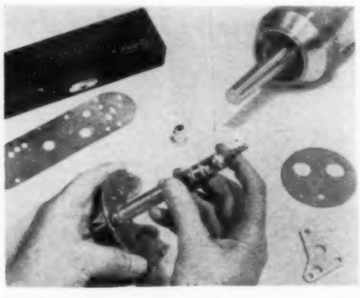
Optical Tooling Equipment

Modern demand for higher precision has broadened the application of optical tooling and gaging. Many techniques have been brought from the laboratory to the production shop to sup-

Inspector using a Taft-Peirce electronic gage to check accuracy of V-block against a master.



King portable hardness tester has chain adapter to make accurate readings on any shaped part.



Kwik Chek precision hole gage was developed through Hamilton Watch Co. microengineering techniques.

Micro-Scriber, built by Wm. L. Riggs Co., easily scribes circles with diameters as small as 0.02 inch. Maximum capacity is 0.25 inch.

plement existing optical methods. Optical tools often use the principle of multiplying the measured element increasing precision accordingly.

An autocollimator made by George Scherr Co., measures angles directly to one second of an arc. By use of a differential measurement technique, the instrument can measure flatness, straightness, squareness, parallelism or alignment without the need for calibrated standards.

For the accurate gaging of bores such as ring and snap gages, Leitz has developed a device called a Perflectometer. The instrument consists of two miscroscopes situated on a common optical axis. One of the microscopes projects a cross-hair onto the work. The other microscope forms the image of the cross-hair as reflected from the workpiece. The reflected image is brought into alignment and measurements are accomplished by reading a scale with a microscope having a micrometer eyepiece. The measuring accuracy of the equipment is ±0.000012 inch.

Dividing Tools: A Leitz master optical dividing head increases precision

Leitz dividing head uses a double microscope pickup to compensate for spacing errors which result from eccentricity.

by the use of a double microscopic pickup. This optical compensation automatically offsets any spacing errors that may result from eccentricity. To make the head as universal as possible, the main body can be tilted ±100 deg between horizontal and vertical. It is positively locked in any tilted position by band brakes. To increase the accuracy of tilt, an optical segment and optical vernier in an inclined eyepiece are provided, instead of mechanical graduation. A detachable motor drive to the spindle is available making it possible to use the head for performing light machining operations.

To simplify reading and eliminate eyestrain, a projection screen is built into the Sagem optical dividing head. This screen allows simultaneous examination by more than one person. In order to facilitate centering, the spindle of the head can be disengaged, permitting rapid rotation by hand.

A Sagem optical rotary table has the same features as the dividing head. The table allows settings in polar coordi-

Scherr microprojector has a horizontal stage. Work may be laid flat and checked without the aid of fixtures.

Covel Optical comparator. Top stage moves horizontally on hardened steel balls in a ground V-way and flatway. Working area is 13 by 6 inches.

nates. The division of the glass master disk is performed on a high-precision machine. Since the disk is fixed to the table, the measuring accuracy is not affected by wear of the worm and worm wheel.

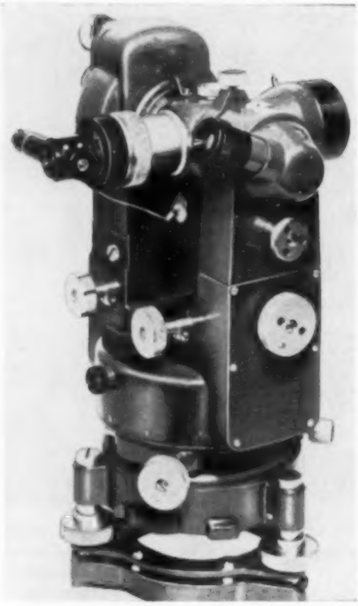
These optical dividing instruments increase the usefulness of jig-borers, drilling, grinding and horizontal boring machines.

Comparators: A new George Scherr Co. microprojector has the advantage of a horizontal stage for supporting flat work without fixtures or holding devices. When using the micrometer slide, both measuring motions are performed on the horizontal plane. A graduated adjustment will tilt the stage to a desired helix angle of a thread or rake angle of a tool.

A newly designed Covel optical comparator is mounted on casters and can be moved easily from place to place. All measurements are taken by carbide dial indicators furnished as standard equipment.

Optical Measuring Tools, Ltd. is offering a large-capacity universal projector to meet the demand for larger and more versatile equipment. A line of accessory items broadens the applications from the basic unit. Condenser lenses are all housed in a rotary turret and are clearly identified. After selecting the condenser appropriate to the lens in use, the turret is rotated to the correct position.

Microscope Measurements: Several new optical instruments have been added to the Carl Zeiss line of equipment. An interference microscope superim-

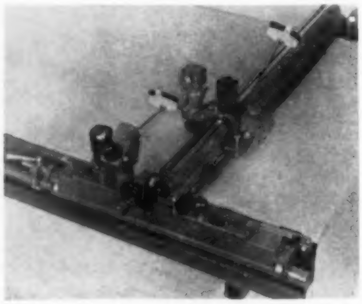


Engis Equipment Co. autocollimating theodolite. These instruments are useful for research and production inspection.

poses two light sources. These two sources generate interference bands. The distortion of these bands is a measure of surface roughness.

The Zeiss universal measuring microscope allows measurements to be made in plane rectangular and polar coordinates, as well as in three-space rectangular and cylinder coordinates. Measuring methods are: with optical feeler, with mechanical feeler and by optical image. High-precision glass scales and circles which can be read to 0.00005 inch and one second of arc give accurate readings.

The Zeiss light-section microscope ascertains surface microstructure. A band of light is thrown upon the surface of the workpiece at an angle of about 45 deg. When viewed from above, the band assumes the profile of the surface. The test piece is viewed with a microscope to measure surface finish.



Aero coordinatograph can be used with optical comparator for visual grinding.

A toolmaker's microscope is manufactured by The Gaertner Scientific Corp. has a closed-circuit television system. The image, normally seen through the eyepiece, is produced on a screen for remote or multiple viewing.

A coordinatograph made by Aero Service Corp., primarily designed to draw grids on metal, can be used to measure completed layouts of finished etched circuits. The instrument can be also used for visual grinding in combination with an optical comparator.

Special Purpose Equipment

With the types of processes and equipment increasing in number and application, classification becomes difficult. The research process of yesterday is the production process of today. This section is a source of ideas for potential application in addition to a discussion of special equipment. These "specials" are important contributions to our production technology.

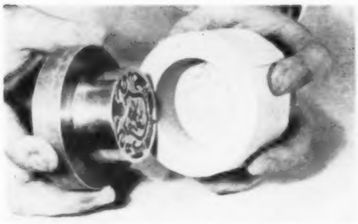
Ultrasonics: Use of a transducer to produce high-frequency sound waves has been applied to cleaning and gaging by Branson Ultrasonics. For cleaning, a small amount of detergent is added to water and agitated by ultrasonic energy to penetrate under dirt, oil and other insoluble soils. Use of the process for cleaning new parts before assembly has been increasing where fits are critical on ball bearings, automatic transmission parts and aircraft components. Small parts for electronic equipment, watches and jewelry, instruments, maintenance of production equipment, and removal of radioactive materials from contaminated parts are a few of the uses for ultrasonic cleaning. Tanks for this process may be 10 ft in length, using many immersed transducer units. These long units make possible the use of conveyors to carry the parts through the cleaning cycle.

Another interesting application of ultrasonics by Branson provides for checking material thicknesses and flaw detection. The piezoelectric transducer, which has an active head only ½ inch diameter, is placed in contact with the material being tested. The continuous ultrasonic waves pass into and through the material and are reflected back from the first discontinuity encountered, either an internal flaw or the opposite surface. Each thickness has its own natural resonant frequency and when reached, there will be a considerable increase in the amplitude of the vibrations in the material. These signals are amplified and indicated on a recording instrument. The signals can be used for sorting, instead of recording, by having the signal actuate a relay, thus acting as a feed-back component of an automation system.

Investment Casting: A method of investment casting developed in England by the British Industries Corp. does not use expendable patterns to make the molds. The slurry poured over the pattern is a mixture of ethyl silicate and a jelling agent. When set, the mixture forms a flexible jell, which can be easily stripped from the pattern. The mold is fired to form a rigid refractory ready for casting. Any of the castable metals may be used for the castings, including nickel and cobalt-base alloys, heat-resisting steels, tool steels, iron and many forms of nonferrous materials. Castings from a fraction of an ounce to about half a ton are being produced with as-cast surfaces of 80 to 120 microinch. Tolerances of ±0.005 can be cast on parts up to 3 inches long.

Other items developed by the British

Ultrasonic generator by Branson Ultrasonics Corp. with a switch for directing high-frequency energy to either of the two tank transducers.



Pattern being stripped from the rubber-like mold made by the British Industries Corp. Shaw process. This mold without draft permits molding smooth faces and reproduction of fine detail needed in the steel casting.

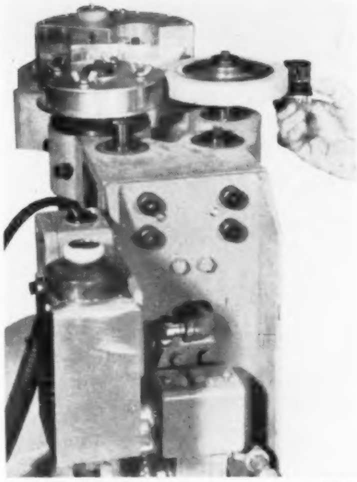
Industries Corp. include a low-cost vacuum melting furnace capable of making castings up to 15 lb and a fully automatic small die-cast machine. Slag-free pouring is possible because a new quick-change composite crucible lining which removes the impurities from the melted materials is used. The DCMT die-casting machine has fail-safe cycling, die cleaning and lubricating mechanism, electronic ladling and die temperature control. It has a capacity for producing zinc die castings up to 1 lb at rates up to 1500 shots per hour.

Marking Machines: Identification of products which are similar in form but with different operation characteristics has been one of the reasons for the development of efficient marking machines. With an offset printing unit, developed by Jas H. Matthews & Co., small electrical condensers are marked automatically while moving on a production line. The unit prints specification data and trademark identification on the parts as they pass by the geared head with its simple-revolution clutch. Other units eliminate the necessity of stocking premarked containers. They print product information on three steel bands simultaneously and blast-etch product sizes on large ceramic parts. In the latter, the part is held in an interchangeable nesting fixture which will hold a wide variety of long or short cylindrical parts during marking.

The Noble & Westbrook Mfg. Co. has an all-pneumatic roll marking machine which will mark either round or flat workpieces. It may be hand-loaded or hopper-fed for most industrial light-duty marking.

Many printed products are being made by Anderson & Sons for identification of products and people. Name plates and escutcheons, dials, panels, rules, printed circuits and adhesive backed plates are produced by lithographing, embossing, silk screening, engraving and etching.

Balancing: Unbalance is the result of poor distribution of mass in a rotating part causing vibration which occurs



Jas. H. Matthews & Co. rotary offset printer for production-line marking of small electrical condensers.

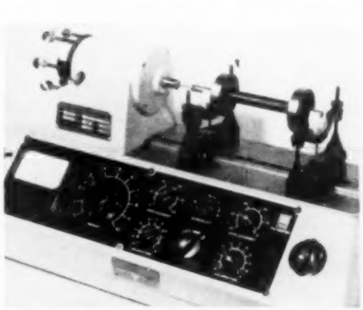
when the rotational axis does not coincide with the principal axis of inertia. The part tries to rotate about its axis of inertia and the eccentric motion develops a centrifugal force working against the bearings. This restraint by the bearings working against the force causes destructive vibration. As the speed increases, the centrifugal force increases as the square of the speed. The Rava Olsen static-dynamic balancing machine is capable of solving the problems of unbalance on a production basis. A minimum of setup time is required to change from one part to another. The amount of unbalance may be read in oz-in. or other preselected units. A seismic mounted vibration pickup unit keeps floor noises and other extraneous disturbances to a minimum. The machine can run at speeds up to 36,000 rpm. Tinius Olsen Testing Machine Co. also produces portable static and dynamic balancers.

A new multipurpose balancing system, developed by International Research and Development offers the advantages of a portable instrument for checking machines and products, trouble shooting to locate undesirable vibrations, in-place balancing and dynamic balancing. Causes of vibration, e.g., unbalance, misalignment, faulty bearings, etc., are pinpointed by the analyzer without costly trial and error.

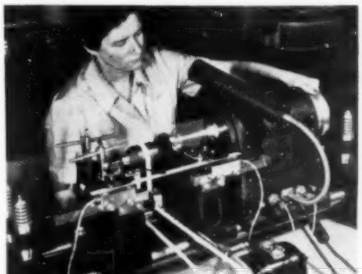
Using a photoelectric tube for actuation of a work orientor, the R. B. Annis Co. positions a workpiece being balanced into the proper position for drilling out the excess material causing unbalance. The same light beam and targeting arrangement is employed for the orientor as the phase scanner employed on this electronic balancer. Following measurement of unbalance, the spinning workpiece is quickly decelerated by dynamic braking, and rolled to the proper spot for the drilling operation.

Capable of balancing to 0.004 oz-in., a new industrial balancer has been designed by the Alemite Div. of Stewart-Warner Corp. for specific use in automobile and truck engine rebuilding, plant maintenance, quality control and short-run production. It will balance parts weighing between one-quarter and 300 lb with a diametral range of ¼ to 30 inches.

Heating and Cooling: Both extremes of heat and cold have proved useful in manufacturing. Heat has been used for treatment of materials to obtain a particular state, either for desired hardness of metals, or for fabrication of one material to another by welding, brazing, or forging. Handy & Harman have built a high-production gas-air brazing machine for making impellers for portable power tools every six seconds. Low-cost stampings and screw machine parts are joined into strong, light, economical assemblies. An interesting design feature of the machine is the transfer



The Tinius Olsen Rava electrodynamic balancing machine.



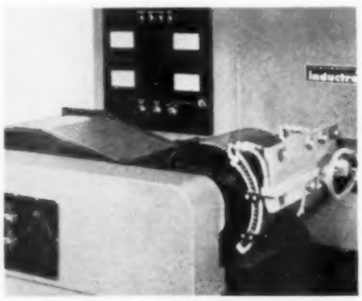
Dynograph balancing machine by R. B. Annis Co. with photoelectric orientor to position part for drilling.

mechanism which moves the part being brazed from station to station, torch to torch, and then to the water quench.

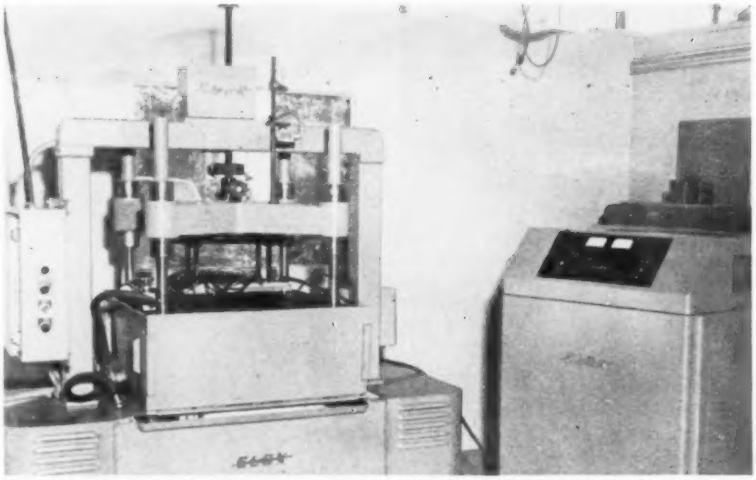
Maximum tool hardness without scale or decarburizing will reduce tooling and production costs. A positive, neutral atmosphere required for this type of hardening is produced by the Sentry Co. Model Y furnace. Another interesting development in the tool-hardening field is the Hevi-Duty Electric Co. immersed electrode salt bath for hardening high-speed steel. The ceramic pot permits the furnace user to operate it at temperatures up to 2400 F. Other Hevi-Duty furnaces include a shaker hearth for bright hardening, an atmosphere tight box for tempering and drawing, a round style bench oven (to 400 F) and a bench furnace (to 1850 F).

The Inductron machine of the Process Machinery Div., The Cincinnati Milling Machine Co., is a high-frequency induction heating unit performing an interesting hardening job. Both ends of a push rod are being hardened in an automatic and continuous operation. Parts are loaded on a magazine-type fixture which loads them into notches on the periphery of a rotating drum fixture. The ends of the parts feed into an arc-shaped induction coil which heats the ends to the proper temperature for hardening. Then, the quenching operation takes place by dropping the parts into a water tank by gravity. In addition to the induction-heating equipment, Process Machinery Div. have made additional development on their Flamatic precision flame-treating machines.

In the refrigeration field, Cincinnati Sub-Zero Products have developed a small unit which will operate at temperatures from −70 to −180 F. It is a portable plug-in type unit with a totally



Tooling for hardening push rods on a Cincinnati Inductron high-frequency induction heating machine.



Elox Corp. electrical discharge machine used for making dies up to 12,500 lb and 42 inches in width, which is the clearance between the guide pins.

enclosed capillary system. This unit has been found useful for production chilling and testing new materials, metals and electronic components.

Electrical Discharge Machines: Originally designed to remove broken tools or metal parts during salvage operations of products almost finished, electrical discharge machines have progressed in size and capacity to become an important production process. Recent developments have made the process more productive per dollar spent. A case in point is the use of die-cast metal alloys for electrodes in Easco Products Sparcatron machine. In many cases, it has been possible to use a zinc die-cast part to reproduce the new dies for the same part at savings in man-hours.

In the development of heavy machinery for electrical discharge machining, the new Elox Corp. M-600 series incorporate the basic principle of a die set, with the precision demanded of the process. Weights up to 12,500 lb may be entered through an opening as large as 42 inches. Heat treating of dies before cutting is possible since the hardness of the metal does not affect the cutting action.

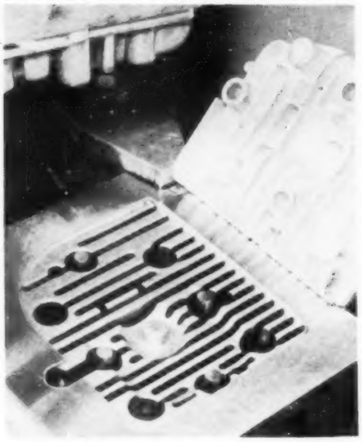
Brazing of impeller assemblies on a Handy & Harman transfer machine.

A machine designed especially for the removal of broken drills, taps, reamers, studs or other metal parts is made by Jiffy Disintegrators. It is portable and has a head that travels by ball bearing carriage on a double-track radial arm with finger-touch lock and movement control.

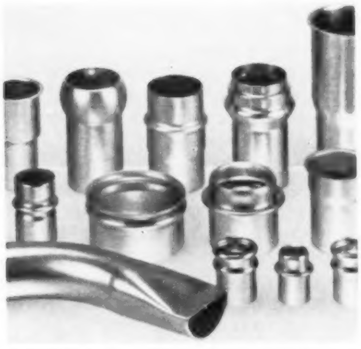
Another interesting electrical discharge machine is the Eleroda D1, designed by Charmilles Engineering Works, Ltd. Examples of the work being done by this machine consist of cutting dies for the watch industry, watch-case form dies and other precision parts. The dies were required to have a 20-microinch finish and tolerances within ±0.0004 inch.

Processes: The products of the tube end-forming machinery and the finishing of holes by ballizing have interesting potential. Complex shapes have been formed on the tube ends automatically in one operation, which would have taken multiple operations and much handling of the material by other methods. The machines for this process are manufactured by Vaill Eng. Co.

The ballizing process, developed by Industrial Tectonics, sizes and finishes inside diameters using precision balls. Balls used for the process are slightly larger than the hole being finished. Parts are placed under a ram and the balls are forced into the hole by hydraulic pressure. After passing a number of the balls through the hole, the



Die-cast die made on a Easco Products Sparcatron using a die-cast electrode from the existing die.



Examples of tube products with ends formed on Vaill Eng. machines.

metal is displaced to give a burnished surface to the finished hole.

Boring Machines

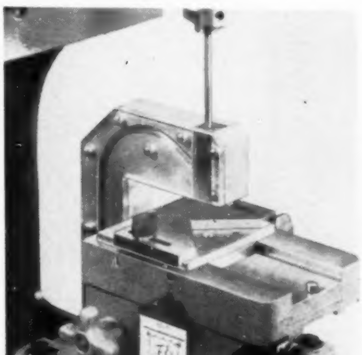
Conventional boring mills now are more versatile and dependable through the additions of optical equipment, high-speed spindles, protection of the ways by covers, and larger motor drives. One boring mill, designed by the Ateliers Marcel Pegard, has preselection of feeds and speeds, instantaneous and simultaneous locking and unlocking of movable parts, a pendant control suspended from a movable jig, and a chip-collector under the spindle and boring head. An automatic coordinate setting device has adjustable stops which enable the operator to reproduce distances for work on similar parts. Stops are adjusted during machining of the first workpiece by means of optical readers. All motions on the machine may be controlled from the pendant box. These motions are pictorially illustrated on the pendant box plate.

Direct reading through a micrometer reader at normal reading distance is a feature of the Manex No. 2 optical jig borer built by Manex Machinery Corp. With direct optical positioning, it protects against errors due to mechanical failure or operator fatigue resulting from peering through microscopes with one eye as on other types of optical equipment. The microscope adjustments eliminate the necessity for using rods or gage blocks for location. Among the features included are a magnetic brake, automatic boring feed up and down with micrometer depth stops, and a variable-speed drive from 85 to 3000 rpm. Speed changes can be made by turning a hand crank, and reading the new setting on the built-in tachometer.

Smooth surfaces on the Manex machine prevent chips and dirt from accumulating in crevices. Over-all maintenance is reduced since the covered ways and quill also keep foreign matter out of the operating mechanisms.

Exceptionally large workpieces can be machined easily on the new Suburban Machine Co. angle master. This machine is a precise angular jig boring and milling machine capable of handling many complex machining problems found in tool, die, mold and fixture work. The design of the machine allows the workpiece to be clamped to the table in one simple setup. All subsequent machining operations are performed by setting the head, ram, column and saddles to their predetermined positions, making use of 360 deg travel on all angular components. This machine has a total working surface of 16 x 48 inches, a ram travel of 24 inches and a table top to spindle dimension of 22 inches maximum.

A useful feature in the Jungenthat vertical boring mill, distributed by Barer Engineering and Machinery Co., Ltd. is a system of roller and ball bearings guaranteeing a true running table within 0.0002 inch regardless of the weight of workpiece to be machined. Automatic lubrication for the entire machine, and antifriction bearings for all drive mechanisms are features of this mill. In addition, simultaneous feed in two directions and taper turning to 70-deg taper angles are feasible. The machine may have a 40, 55 or 60-inch table and up to 355 fpm. It is equipped with an overload clutch, large scales calibrated to 0.001 inch and main gearbox with hardened and ground gears.

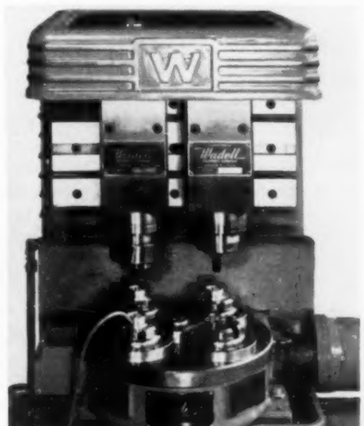


Industrial Tectonics Ball-omatic fixture for ballizing parts with various diameters by adjusting movable anvil.

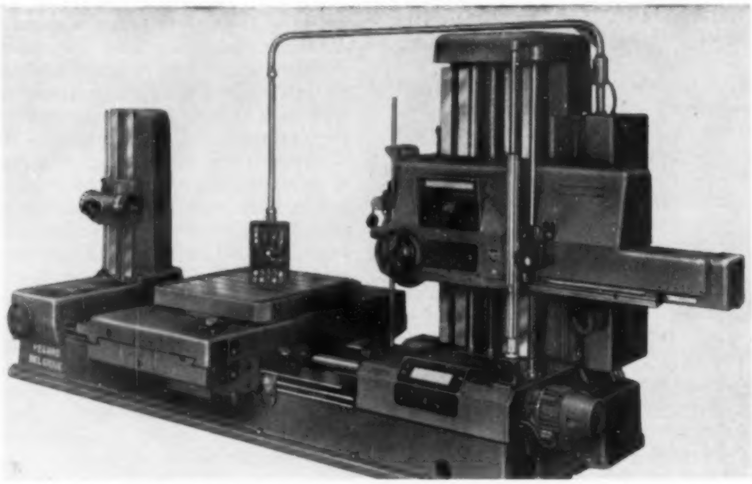
Controlled by a simple plate cam, the Wadell automatic vertical precision boring machine features a completely automatic cycle. Vertical construction represents a new concept in machine design by allowing convenient handling of workpieces, simplified tooling and more efficient use of two or more spindles. Automatic index tables have the advantages of allowing loading and unloading of workpieces while the machine is cycling automatically. Wide variation of feed rates are possible with change gears.

Also, the Wadell horizontal precision boring machines, both single and double-end types, have a hydraulic feed with rapid traverse infeed, outfeed and rapid return, based on the cycle desired. An automatic index table for the boring machines has an accuracy of 10 seconds of arc and a standard master index plate with 12 positions. Tables are electromechanical and can be easily synchronized to the movements of any machine tool.

Table-top boring mills, designed by Scharmann Machine Corp. provide versatility, accuracy and power combined with the economy of space and capital investment. Being universal in applica-



Wadell vertical boring machine equipped with index table for automatic cycling on a tool operation. The workpiece is loaded into a fixture, indexed under the first spindle, operation performed, indexed to the second position for the second operation, and then to the unloading position.



Pegard universal boring and milling machine with the jib mounted pendant box and optical positioning readers.

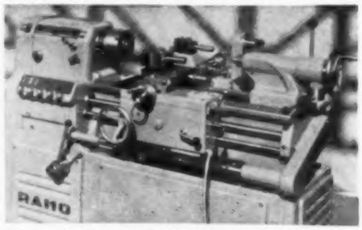
tion, milling, boring and drilling of a workpiece are possible in one setup. For the small plant, this versatility reduces the number of single-operation machines required. On the WB75 (3-inch spindle) and the FB40 (4-inch spindle), equipment common on both machines includes the mechanism for rapid traverse of all movements, automatic tool ejector, a rotary table and an easy-to-use optical measuring device. With these optics, the accurate coordination of the vertical travel of the headstock, tailstock bearing and table cross travel are possible. A new addition to the FB40 is a d-c drive, operated on a-c power, to provide infinitely variable speeds over a wider range.

Using design principles employed in lathes, the Pfeifer precision boring mill has the spindle head at the left of the bed. The operational controls are centrally located to be within easy reach of the operator. They are made with hardened mating bearing surfaces contacting the bedways, which are finished by the spot-grind method of scraping. The Pfeifer boring mill is distributed by Aaron Machinery Co. along with the Imperial line of horizontal boring machines. The Imperial assures full utilization of carbide-tipped tools by a power saving drive and wide range of speeds and feeds. It has a bearing system designed to drive the inner and outer hollow spindle independently, a stationary tool post, a height-adjustable drill head, and a rotary table, which moves crosswise and endwise.

Lathes

Turning has been a basic problem ever since man first mounted a piece of wood between centers and used a bent sapling for motive power. Progress, generally, in production methods can be measured by the developments in lathes. It has progressed from the water-powered units to the individual motor driven machines with the automatic feeds and tracer controls. Keeping pace with the advancements, the Koping hydraulic copying lathe, distributed by Homestrand Inc., can be operated by hand or by automatic controls for four machining cycles. It has a swing of $15\frac{3}{4}$ inches over a center distance of 47 inches. Designed for convenient loading, the spindle is located in the conventional position while the master, or template, is placed on the top of the lathe to keep it away from chips or dust.

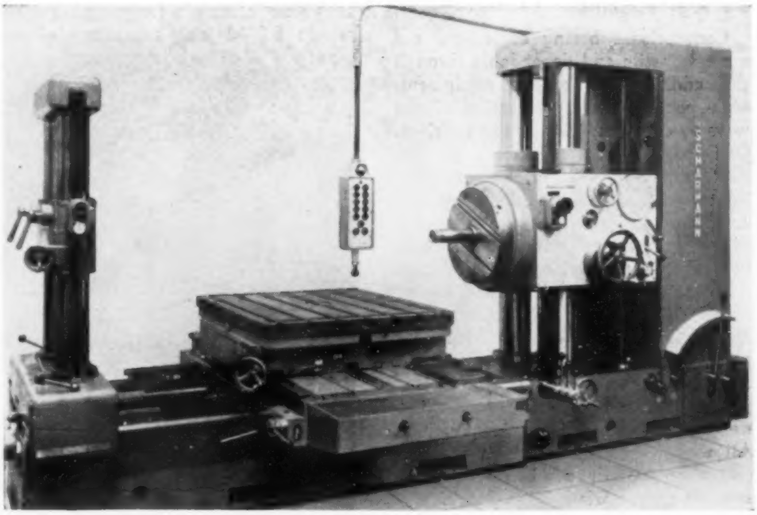
Another copying lathe with interesting features has been produced by T. S. Harrison & Sons, Ltd. A convenient design feature is a switch which changes this lathe from duplicating to standard operations without removing or adding any parts. The copying unit is built into the rear of the machine, leaving normal lathe operations unrestricted. Parts can be reproduced from either flat or round templates. Producing the first workpiece by normal turning operations makes a template for any subsequent parts. Control of the tool slide is through hydraulic system containing a cylinder, spool valve and stylus system. Harrison also manufactures geared head engine lathes.



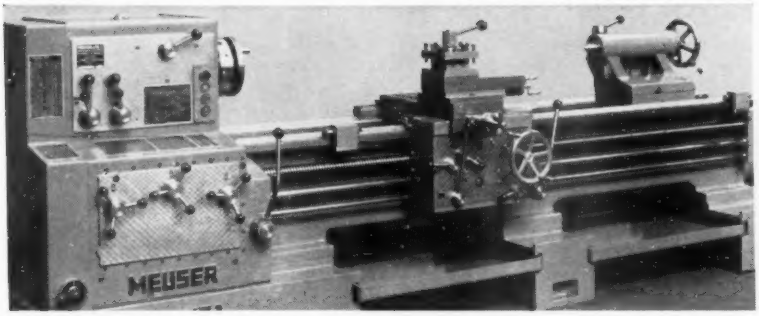
Ramo lathe equipped with the Polybut stops for controlling transverse and longitudinal movements.

An automated turret lathe with a 14-inch swing and $1\frac{5}{8}$-inch spindle hole was developed by Logan Engineering Co. Aimed at accuracy and flexibility, the machines have the turret feed driven by a d-c motor with rapid travel to give a wide selection of setups. Variable-speed drive, adjustable infeed limit position for each turret station, adjustable rapid travel and a two-speed reversing motor are other features of this equipment.

Sheldon Machine Co. has designed a new high-speed second operation hand turret lathe and a hydraulic tracer lathe. The turret lathe features a push button variable drive with spindle speeds from 40 to 2000 rpm. These



Scharmann FB40 table type horizontal boring mill with the headstock suspended between two steel columns—which adds the strength and rigidity of a production mill to the accuracy and operating ease of this precision boring machine.



Barer-Meuser lathe with 18 forward speeds and 9 reverse speeds.

speeds may be read on a tachometer built in the headstock.

Using a carbide feeler which limits the tool penetration into the workpiece, an automatic stop system for lathes controls facing, grooving, recessing or chamfering. Settings are easily made without any longitudinal or transversal adjustment after original setting up of the tool. The system called Polybut, is an attachment on the Ramo lathe designed and built by Ateliers Marcel. Turning tools are held on an accurate positioning turret which has an accuracy better than 0.004 inch. These attachments make the lathe adaptable for either toolroom or production work.

The Barer Meuser L-type production lathes have heavy base castings and beds with precision finished gears, spindles and micrometer stops on longitudinal and cross feeds. Other machines made in West Germany for heavy-duty turning are a series of lathes manufactured by Eugen Weisser & Co. Their products include high-speed toolroom lathes, electrically controlled production lathes, heavy-duty toolroom lathes and Multicop hydraulic copying unit.

To supplement their line of threading tools, National Acme Co. is importing a single spindle automatic from England. Built by B.S.A. Tools, Ltd., the machine has two forward and two reverse spindle speeds. It is equipped with the Namco threading tools and Verse-O-Tools on the turret.

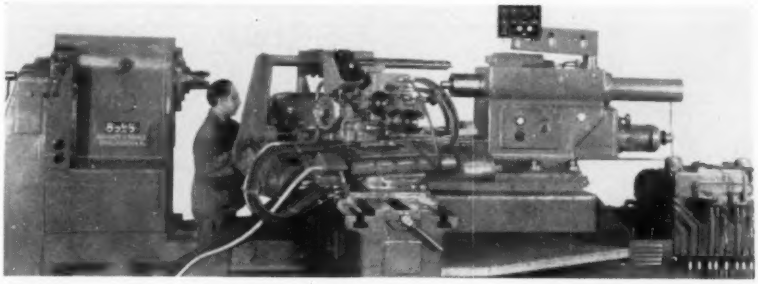
Drilling and Tapping Machines

For handling short and intermediate run drilling and tapping operations, turret drilling machines built by Howe and Fant, Inc., increase output per man as much as five times over conventional methods and greatly improve work quality without any sacrifice in ability to change rapidly from one job to another. Model B machine has increased capacity and range over the standard Model A. Its capacity in steel is one inch. All the features of Model A are included plus preselective, infinitely variable power feeds and optional power indexing.

Positioning tables, for use on these turret drills or other machines with sufficient throat depth, are capable of handling hole patterns up to $10\frac{1}{2}$ by 12 inches. They are fast acting, extremely accurate and easily changed from job to job.

Leadscrew tapping attachment, designed by Procunier Safety Chuck Co., derives power from standard drill presses and uses twin air cylinders for tapping and reversing pressures. Five methods of operation are available: automatic, pushbutton cycle, pushbutton jog, foot switch cycle and foot switch jog. Leadscrew assemblies are quickly interchangeable and are available in standard pitches from 20 to 96. Leadscrew nut is adjustable for wear. Leadscrew threads are ground after hardening; maximum travel is $\frac{3}{16}$ inch.

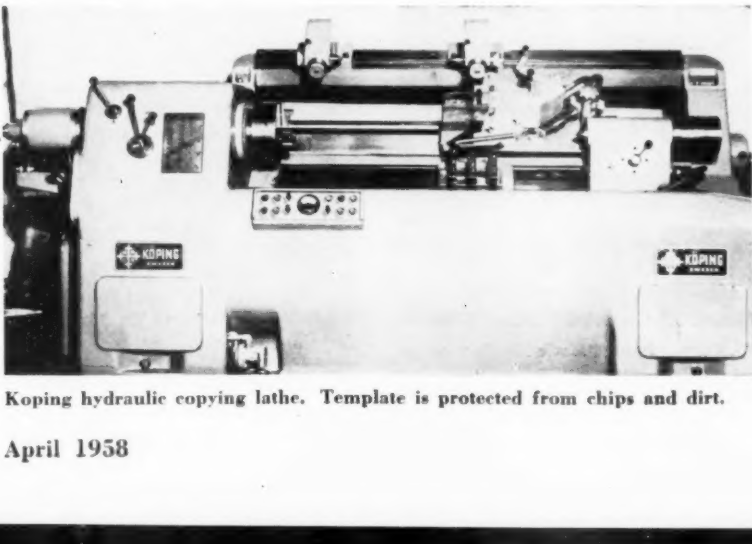
New positive drill head has been designed for semi or automatic operations by Bedford Gear and Machine Products, Inc. A compact package, it readily fits with other units for automation. It operates in any position and may be end or base mounted. Longitudinal feed power is supplied from compressed air. Rotary action is furnished by its 3-phase motor generating $\frac{1}{4}$ to $7\frac{1}{2}$ hp with speeds ranging from 245 to 8640 rpm. Depth control is repetitive within



Bokoe spinning and flow-forming lathe for hydraulic spinning, controlled by template or wall-thickness of the workpiece.

0.0005 inch. Stroke is either $2\frac{1}{2}$ or $3\frac{1}{2}$ inches. In addition to drilling, reaming, tapping, countersinking and counterboring, it can also be used for hollow milling, tube flaring, tube facing, chamfering and boring.

Precision slide assemblies for use as stock components when building special machines have been designed by Russell T. Gilman, Inc. They are available in a broad range of types and sizes for varied requirements. Stroke lengths vary from $\frac{3}{4}$ to 8 inches with slide working surfaces from 2 by 3 to 8 by 24 inches. Sliding surfaces are either milled or hand scraped. In addition to basic slides with gib and adjusting

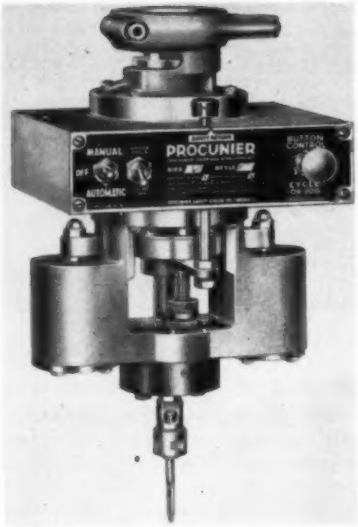


Koping hydraulic copying lathe. Template is protected from chips and dirt.

screws, other types include control features such as a return spring, micrometer stop, leadscrew and air or hydraulic cylinder.

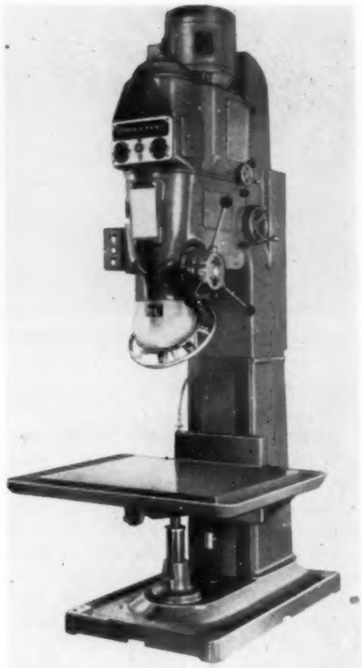
Air-powered with hydraulically controlled feed feature Madison Industries, Inc. gun type drilling machine. Its 9-inch stroke has a variable feed from 0 to 40 ipm. Spindle motor is 5 hp providing fixed spindle speeds from 680 to 8000 rpm. Equipped with a mist lubricator, its capacity in steel is $\frac{5}{8}$-inch diameter maximum. The electrical control panel includes starter for pump motor and spindle motor with on-off switch controls for drilling cycle and a control to actuate a solenoid valve for coolant flow through the gun drill.

For use on multiple-spindle automatic screw machines, new deep-hole drilling tools perform drilling jobs previously regarded as impractical or even impossible. Oscillating action of the tool breaks the chips into fine granules, eliminating the chip problem and affording longer drill life through cooler operation. In addition, finer finishes, closer tolerances and better concentricity are maintained.



Procunier pushbutton tapping attachment has 3/16 inch diameter capacity in free-machining steel.

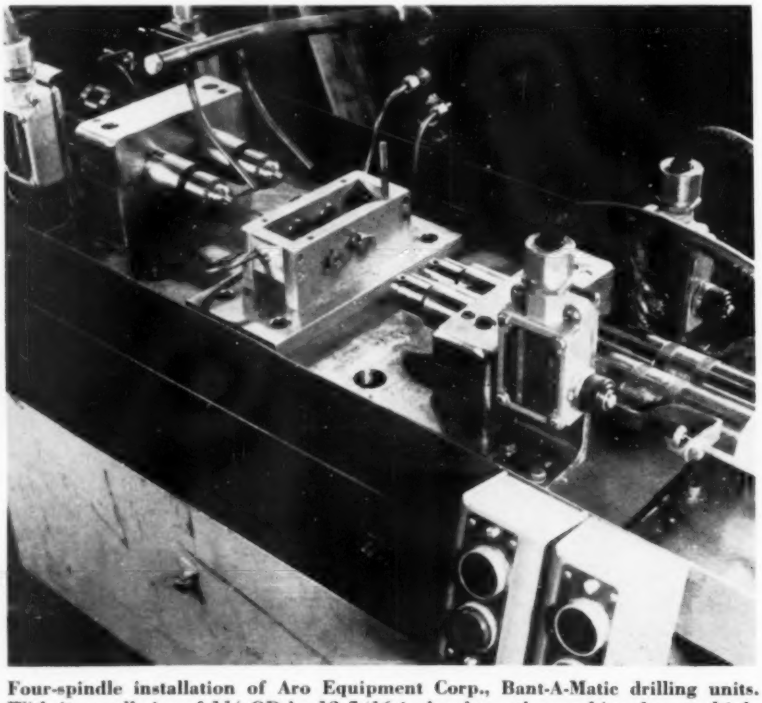
The oscillation motion is derived from a flutter or wave cam built into the tool. It oscillates 0.006 inch three times per revolution. The tool, designed and developed by Boyar-Schultz Corp., is driven by the drill speeder spline shaft. If the spindle speed is not fast enough, a revolving type tool is used to increase the speed. By revolving the drill in the direction opposite to that of the spindle



Howe and Fant turret drill with power indexing. Quill feed is 9 inches.

it is possible to attain proper speed as well as improvement of concentricity.

Design and development of a completely new clutch increases the power and sensitivity of tapping heads built by Jarvis Corp. Straight-line action of the clutch provides 100 percent driving surface, increasing power to twice that of the former clutch. This design also provides sensitive rapid response to light pressure on the drillpress lever and insures easier and more accurate tapping. Clutch life has been more than doubled, due to the drive being evenly distributed over the entire surface of the clutch facing. Tapping heads incorporating this clutch have also been redesigned for accuracy and dependability.



Four-spindle installation of Aro Equipment Corp., Bant-A-Matic drilling units. With its small size of 1½-OD by 12 5/16 inches long, the machine does multiple spindle drilling which could not ordinarily be done by conventional equipment.

Saws and Cutoff Machines

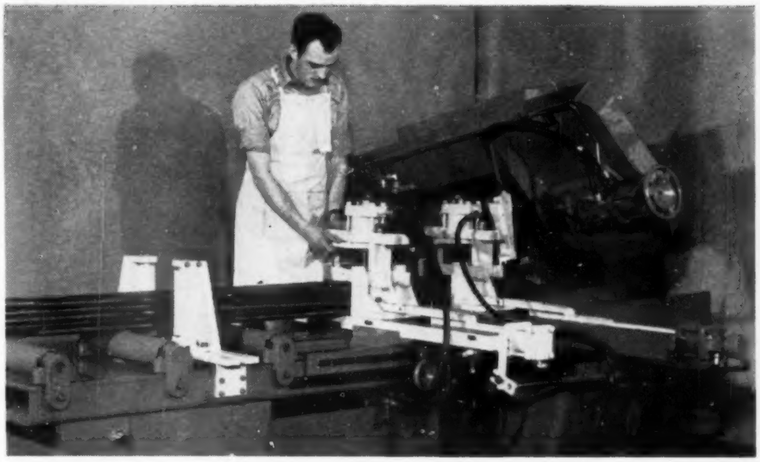
Many production processes begin with material cut with saws and cutoff machines. Fully automatic cutoff machines and high-production contour sawing machinery teamed with high-speed steel saw bands produce economically, accurately and easily, even on the tough, hard to machine alloys. Two cutoff machines, developed by The DoAll Co., exemplify the ease and speed with which cutoff work can be handled in the big or small shop. The automatic, large-capacity model C-58 power saw has an automatic indexing feature which holds cut lengths within thousandths for slugging operations. On the other machine, the Contour-matic band machine, production fixturing is simple

and inexpensive because of its hydraulically operated power work table. It can outperform some older machines on slotting, slitting and notching operations.

For production line cutting of ferrous and nonferrous materials, the Stone Machinery Co. has developed a line of high-speed cutting equipment. These machines feature automatic bar feed, pneumatic control with oil check, patented wheel wear compensator and positive action air vises.

In the circular saw field, interesting developments have been made on the sawing machines and on the equipment to sharpen the saw blades. The DeWalt Div. of American Machine and Foundry Co. has designed a radial arm saw for cutting nonferrous materials. It has a 5-inch diam column with power elevation and a built-in power brake. Safety features include a pilot control circuit, an easy-to-use kickback device, dynamic power brake, overload and under-voltage protection, safety saw guard and arbor cover and an emergency bar to stop all power on the front of the machine.

For cutoff operations on tubing, Henry A. Spittler Co. has developed a line with a cutting range up to 2 inches diam. Steel, brass, aluminum and copper tubing are easily machined on rectangular or miter cuts up to 45 deg. Clamping of the material is accomplished by spring pressure activated when operating the saw gears. Cooling of the circular saw is done by a piston pump connected to the reciprocating action of the gear unit.



Nesting vises increase cutoff rates of the DoAll power saw by permitting many small bars to be cut at one time.

Jarvis Torqomatic tapping head incorporates a clutch to double tap life.

To keep the saws sharp, Hamco Machines has developed a machine to automatically sharpen all types of carbon and high-speed steel blades from $\frac{1}{2}$ to 14 inches diam. By using a master indexing system, it is possible to make new saws concentric with the bore, or even change the number of teeth in the saw to more or less per inch.

Versatility is a requirement of wire straightening and cutoff machines which have been designed by The Geo. C. Patterson Machine Co. They will handle round, shaped, square or rectangular ferrous and nonferrous materials. Features of the machines include stationary or flying shear cutoff, variable-speed drives, pendant type control switches and dumping type catcher pans.

Applying the principles of saw operation, the Davis Keyseater Co. machine has its cutter movement guided by a bushing and bushing holder. Different size cutters and bushings are used to obtain the desired keyway. The machine is adaptable for cutting keyways in gears, pulleys, etc., for shaft mounting.

Sawing operations can be only as good as the saw blades being used. For this reason, most of the saw blade manufacturers have been conducting extensive research programs to determine the most efficient tooth contours, chip forming characteristics and materials. Circular Tool Co. has developed a deep slitting and cutoff saw with chip curling design which allows heavier feeds, while giving longer life.

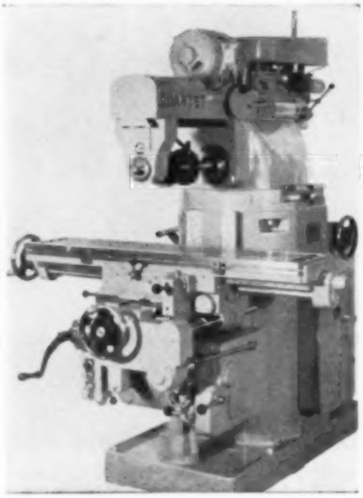
For power hacksawing, the E. H. Wachs Co. has developed a saw blade with a new progressive tooth setting. Both the tooth and gullet capacities are identical in size, but the amount of set of each tooth increases in small amounts from the starting to the finishing ends of the blade. Metal is gradually and smoothly displaced instead of being hogged out, thus reducing the chip load per tooth and increasing blade life.

Two band saws have been developed by The L. S. Starrett Co. for all types of materials, either ferrous or nonferrous, as well as for woods, plastics and other compositions. Development of production methods for HSS band in thin strip, new heat-treating methods for controlling hardness from a superhard cutting edge to a supertough flexible back, and advancements in the welding techniques make possible bands that have welds as strong as the parent metal. An important characteristic of the new blade is the ability to retain hardness even up to red-heat temperatures of 1100 F.

Milling Machines

Easier maintenance, higher speeds and greater versatility and automaticity, plus added machine regidity and operator convenience are the chief trends in milling machine design. Several of these characteristics are emphasized in the Quartet milling machine developed

DeWalt Imperial cutting machine with power-actuated elevation mechanism.



U.S. Burke Quartet milling machine can perform horizontal, vertical, angular and universal operations.

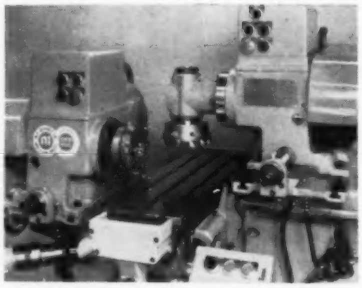
by the U. S. Burke Machine Tool Div. The Quartet can perform four types of milling operations—horizontal, vertical, angular and universal. For universal milling, the turret, which houses the horizontal spindle, is indexed to the required angle. The vertical head is permanently mounted on the rear of a heavy rectangular overarm. It is brought into position by indexing the turret 180 deg. Because of its versatility, this mill is ideally suited for model shops, tool and die plants and diversified manufacturing.

Another machine, the U. S. vertical milling machine, is equipped with an air-hydraulic table feed that provides rapid traverse approach, controlled cutting speed and distance, and automatic rapid retraction.

"Building block" construction of the new U. S. half mill permits it to be equipped with spindle heads mounted opposed, side by side or in staggered heights. This machine is also equipped with an air-hydraulic table feed.

Versatility has been built into the Nichols twin mill of the Robert E. Morris Co. This is a precision two-spindle bed type machine designed for simultaneous milling of opposite or adjacent surfaces, horizontally or vertically. The two geared milling heads are independent units with separate drives and controls. They can be quickly adjusted horizontally and transversely with respect to each other, and can also be offset longitudinally. This allows simultaneous milling of two relatively widely separated surfaces on one setup with one workholding fixture, resulting in obvious savings of time and tooling costs.

Another versatile machine is the Adcock & Shipley size 0 automatic cycle milling machine. It is intended for use in making small components for business machines and electronic equipment, and other small parts.



Nichols twin mill is designed to permit simultaneous milling of opposite or adjacent surfaces.

Motive power for the table is provided by an air cylinder. A hydraulic cylinder with an adjustable metering valve controls the rate of traverse for milling. Short cycle times are made possible by incorporating an air vise on the table. Operation of the vise is automatically coupled to the air cylinder that provides traversing power. The operator thus has only to load and unload components; clamping, unclamping and traversing are automatic. Machines of this type are used by National Cash Register Co. to produce steel components. Floor-to-floor time is $3\frac{1}{2}$ seconds per piece.

The Sajo UF 53 miller (Austin Industrial Corp.) is intended for medium-duty use. It is built in both plain and universal types. Like other Sajo milling machines, it has a number of excellent design features.

The spindle construction, for instance, combines the use of precision cylindrical roller bearings for radial load and ball thrust bearings for axial thrust. This arrangement segregates the functions of the two types of bearings and has proved to be superior to ordinary tapered roller bearing construction.

The top of the knee is protected from chips and dirt by telescoping metal plates. Knee and column bearing surfaces are covered by removable fabric aprons for additional protection. Backlash in climb milling is eliminated by a compensating two-piece bronze feed nut fitted onto the feedscrew. The nut is accessible from outside the machine. A triple-function start-stop-brake lever is located on the left side of the machine column. A coolant system is standard machine equipment.

Construction for maximum machine rigidity and high speeds is exemplified by the Sagem Optimill (Alina Corp.). This machine is equipped with a special high-speed milling head that operates at speeds to 5000 fpm. The spindle can be stopped instantly, even at high speed.

One of the most interesting features of the machine is its ability to instantly give accurate measurements by means of standard built-in measuring bars and optical indicators. In this respect, the machine is allied to a jig borer and it can, in fact, be used for jig boring operations.

The Rouchaud No. 128 cam-operated automatic-cycle milling machine is another versatile machine for small parts. It has automatic longitudinal traverse and selective spindle speeds from 100 to 2000 rpm.

A dial type high-speed universal milling machine (Graham Machine Tool Co.) is equipped with a Pearson reclinable vertical head. This quill type attachment remains on the machine permanently, allowing the operator to change from vertical to horizontal milling operations without removing the workpiece from the machine.

Shaping and Hobbing Machines

Design modifications and new accessories have extended the scope of shapers and hobbers. Missile operations have called for machines of higher precision and a larger range of capacities.

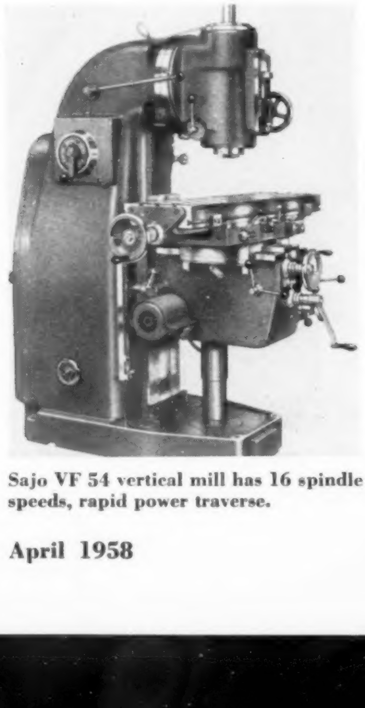
Shapers: High-precision work regardless of surfaces or profiles being machined can be produced on the Jemco H-20 Universal toolroom shaper. A pole changing flange motor allows shaping to be done either with a draw or conventional cut with accuracies of

Adcock & Shipley machine clamps and unclamps workpieces as part of cycle.

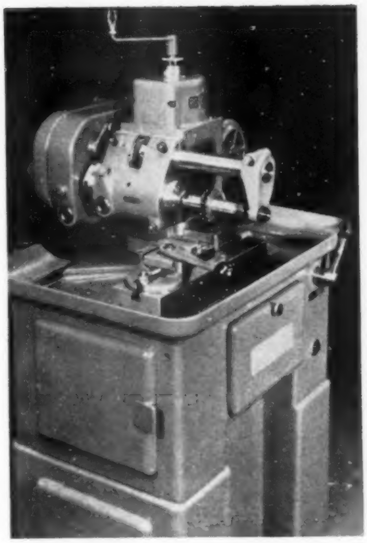
±0.00025 inch guaranteed within the working limits of the machine. It is equipped with a dividing head, tail stock, a swivel vise, a 12¼ x 12¼-inch table with suitable locking jaws and two toolholding fixtures—one for forward cutting and one for draw cutting. The swivel table can be locked in three main working positions and is provided with a fitted-in clamping device which eliminates exchanging and resetting work. The working range of this precision toolroom shaper is 8 x 11⅞ inches.

Irregular shaped stamping and electrode punches of high precision (±0.00025 inch) are possible on the improved Jersey Mfg. Co. K-150 form and punch shaper. A larger dividing head with automatic circular feed permits machining radii and angles automatically. Punches need no additional machining operations when completed on the machine and all workpieces are clamped directly in a collet holder, between centers, or to the coordinate chuck. Machining operations can be checked during the shaping process with the specially built-in 30-power microscope.

Two Swedish companies, Varnamo and Thule (Austin Industrial Corp.), are producing horizontal shaping machines suited to meet modern demands in toolroom or production service. These machines offer as special attachments tilting table tops, keyway cutting attachments, power down feed, automatic tool lifting, index centers and universal tables. The universal tables are mounted on a large trunnion. To provide for compound angular machining, the tables have a tilting top with 15-deg angular adjustment in both horizontal directions. To facilitate setting the table to the desired position, scales graduated in degrees are provided on the trunnion and tilting top.



Sajo VF 54 vertical mill has 16 spindle speeds, rapid power traverse.



Rouchaud machine is cam operated, has automatic longitudinal traverse.

The Chomienne vertical shaper (Austin Industrial Corp.) is accurate, versatile and easy to operate. This machine is valuable for machining irregular shapes and forms. It is provided with a standard rotary table. Twin tool post, crank indexing table, square table and slotting toolholders and tools are available as auxiliary equipment.

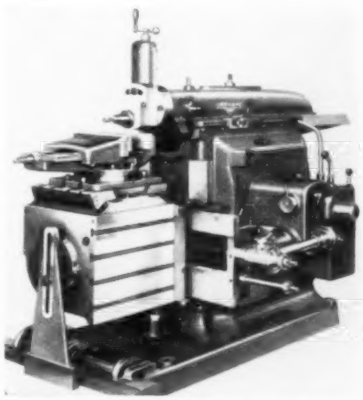
A Schlenker heavy-duty horizontal shaper (Eric R. Bachman Co.) has a 33½-inch stroke and features a heavy V-shaped ram. This self-centering design together with the heavy top gibs results in a completedy closed guide frame. The closed frame lends the machine sturdiness for the heaviest cuts.

Either linear or circular work can be machine divided on the new Manex universal graduating machine. It will operate automatically after setting up the number of divisions, depth and length of the work required. After completing the cutting cycle, the machine stops automatically.

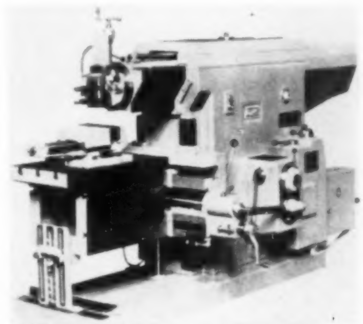
Hobbing and Gear Production: All speeds and feeds of a new spline shaft and pinion hobbing machine are changed by means of electromagnetic multidisk clutches. The changes can be effected while the machine is in operation. The machine is equipped with a jump feed feature enabling the two ends of a spline to be hobbed and the center left blank. The machine can be also supplied with a differential to generate splined shafts of a helical design or helical gears. This machine is manufactured in Germany by Zahnraederfabrik Zuffenhausen (E. R. Bachmann).

A 24-ton Liebherr gear hobber (Mack LeBlang) handles gears up to 50-inch diameter. It has a 25-hp drive with the drive motor positioned just above the hob slide in order to provide all necessary power directly to the hob drive. The machine includes as standard equipment automatic cycling, variable speeds and feeds, automatic table and overarm clamping. Tangential feed and automatic hob shifting are optional.

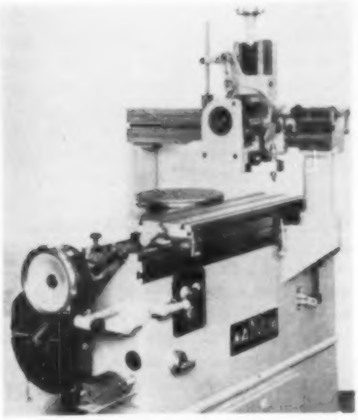
For high production the Sykes Tool Corp. is offering a new Sykomatic gear generator. The machine is equipped with angular cutter relief and an automatic loading device fitted with a rotary turret magazine. The turret, when loaded with a full complement of blanks, permits fully automatic and uninterrupted operation until the complete magazine load is processed. Parts are quickly loaded into spring clamps on the magazine. This loading arrangement allows one operator to maintain full output on a number of machines. The main fixture base is bolted to the



Varnamo shaper with universal table.



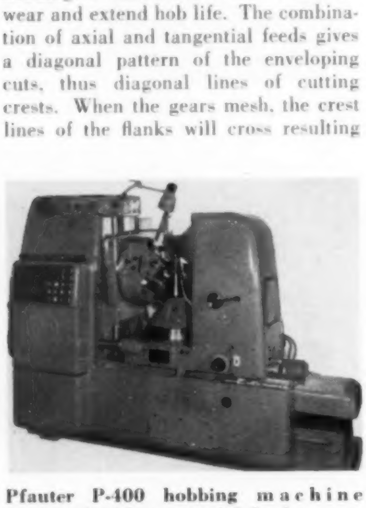
Heavy-duty Schlenker horizontal shaper has a 33½-inch stroke and is driven by a 20-hp motor.



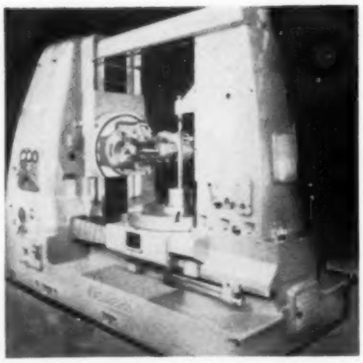
Manex universal graduating machine for marking of linear or circular workpieces automatically after setup.

saddle and a heavy vertical column from this supports the indexing magazine and a top plate.

The Pfauter P-400 hobbing machine is equipped with a combination hob head which permits tangential hobbing of worm gears in addition to hobbing spur gears and helical gears. This machine is equipped with diagonal hobbing features. Diagonal hobbing means feeding the hob not only axially to the work, but moving it at the same time tangentially, thus utilizing most of the hob face for each workpiece. Diagonal hobbing is said to result in even hob wear and extend hob life. The combination of axial and tangential feeds gives a diagonal pattern of the enveloping cuts, thus diagonal lines of cutting crests. When the gears mesh, the crest lines of the flanks will cross resulting



Pfauter P-400 hobbing machine equipped with tangential feed to produce diagonal hobbing.



Zahnraederfabrik Zuffenhausen spline and pinion hobbing machine is equipped with a jump feed feature for finishing two ends of a shaft.

in improved tooth contact and improved rolling properties.

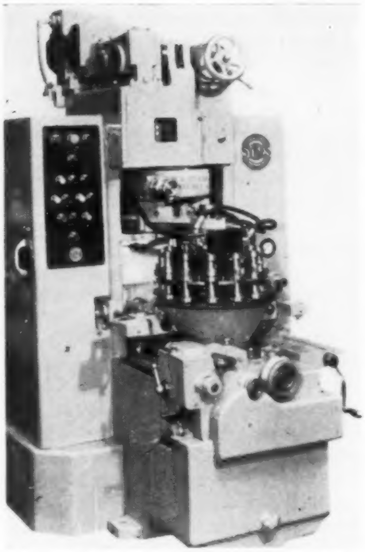
Heligrind (Russell Holbrook and Henderson Inc.) manufactures a spur gear grinding machine for grinding fine pitch gears. This machine is unusually simple in operation and will grind either from the solid, or finish grind precut gears from 16 to 120 diametral pitch.

Grinding and Finishing Machines

Tool Grinders: To meet the heavy demand for conserving skilled workers' time consumed in grinding small drills, Jersey Mfg. Co. has developed a new grinding machine to sharpen drills from 0.012 to 0.120 inch in size. The machine is designed for simplicity so that no difficulty is encountered in producing perfect sharpening even by unskilled help. The drill is clamped into the holder and is checked under a microscope for proper location. Symmetrical sharpenings are possible due to the special shape of the holder.

A variable relieving cam calibrated for accurate repeat settings and a quick-change cam pin plate are features of the chamfer sharpening heads on the Hybco tap chamfer grinder. The unit, manufactured by the Henry P. Boggis & Co., is bench type, and has a dust sealed trunnion action replacing the conventional slides for feeding the grinding wheel. It has collet capacities of either 1$\frac{1}{16}$ inch or 2$\frac{1}{4}$ inch.

Rough and finish grinding can be performed on the tool grinder developed by United Tool Co., for duplicating a given form on either single-point brazed or solid-carbide cutting tools. The unit, called the Contour-o-matic, is a self-contained machine tool having duplicate fixtures for holding the workpiece and the master template or master form tool. Movement of the master template-holding fixture controls the movement of the workpiece against the grinding wheel. After rough grinding at one speed, the machine automatically shifts



Sykomatic gear generator distributed by Sykes Tool Corp. The machine is equipped with an automatic loading device fitted with a rotary turret magazine.

into a higher speed for the finishing operation. To be able to do both operations, a special complex bond and grit combination of the wheel with open-structure working face and a two-speed motor is needed.

Surface Grinders: In an effort to improve the productivity of grinding equipment, better wheels and better basic machines have been developed. To supply this better machine, Boyar-Schultz has designed a 6x18-inch surface grinder with a smooth, longitudinal and transverse hydraulic action. Other features include automatic engagement

Mikron thread milling machine arranged for climb or conventional cutting operations.

of handwheels for hand operation, a heavy-duty spindle with permanently lubricated precision radial thrust bearings operating at 3000 rpm and a column assembly combining both vertical and cross feed in a single unit. The vertical feed assembly consists of a fitted steel worm and bronze gear operating in a sealed gear-box.

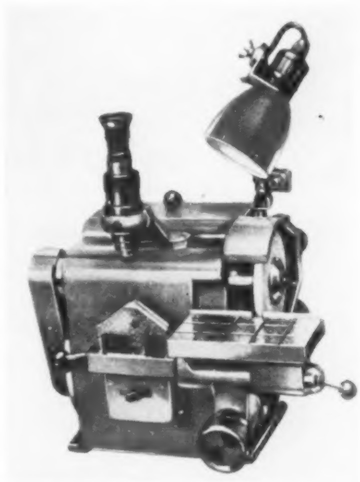
Form grinding of tools has long been a time-consuming job due to the necessity of removing the part from the grinder for checking to assure it was being made within tolerance. To alleviate this situation and reduce the amount of checking off the grinder, the new visual grind projection grinder, produced by Cleveland Grinding Machine Co., permits form grinding to precision tolerances without stopping to consult a comparator. This optical projection grinder facilitates continuous grinding and inspection of intricate forms by blind, combination and through grinding methods. The workpiece being ground is viewed on a ground glass screen with magnification systems of either 10:1 or 100:1. The enlarged image may be simultaneously inspected using charts of the predetermined contours of the workpiece.

Another way by which an organization can keep competitive is to use the most efficient techniques of performing

Boyer-Schultz 6 x 18 hydraulic surface grinder with automatic engagement of handwheels for hand operation.

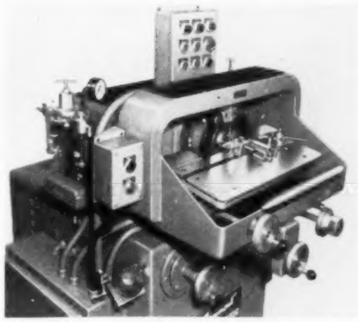
a job. Crush forming of contours into the grinding wheel is a method progressive grinding rooms are using to reduce the preparation time prior to grinding. Combined with an optical system, the Loewe optical profile grinder uses a crush grinding attachment to obtain the proper form for repetitive form grinding. The machine has two magnifications on the projection system of 25:1 and 50:1 plus a single high-pressure mercury-vapor lamp as the light source for reflecting images and shadowgragh pictures. Two d-c motors supply the power for the grinder.

Electrolytic Grinding: The principle of electrolytic grinding is simple since it is basically an electrochemical removal of material. Similar to a plating action in reverse, the tool is the anode from which material is removed by dis-



Jemco drill grinder SM-3 for sharpening drills contains a built-in microscope and diamond truing attachment.

solving into the electrolyte. The diamond wheel in this process acts as an insulator with its protruding diamonds. The spacing between the diamonds allows room for the electrolyte to pass over the workpiece. Voltage for the electrochemical action is low to assure safety for the operator. While the material is being eroded from the workpiece, the diamonds are removing the products of the electrochemical decomposition to present a fresh tool face to the electrolyte and the rotating cathode. Combined with the electrolytic action, the Hammond Machinery Builders have added an oscillating motion to the wheel. This oscillation, to 100 strokes a minute, eliminates the need of manual tool movement, which can be a factor in operating fatigue. Low work point pressure is provided by an adjustable spring which resists the air cylinder on the automatic air table infeed mechanism. This carbide grinder can be used either for conventional hand grinding or for automatically regrinding of throw-away and slug inserts, as well as single-point tools. Chip breakers can be ground on other Hammond electrolytic grinders like the CBE-10 which is designed for single pass, full depth grinding.



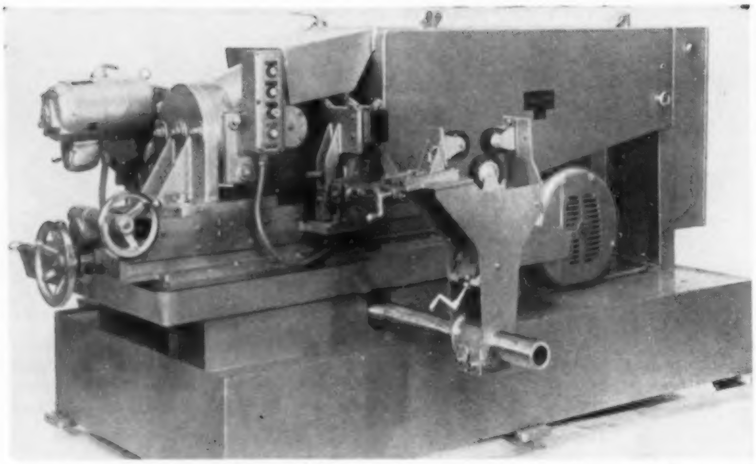
Electrolytic oscillating carbide grinder by Hammond Machinery Builders equipped with automatic air table, compound protractor vise and tool locating gage.

Built as a single unit, the Everite electrochemical machine tool consists of a chip breaker on one side and an offhand grinder on the other side. A built-in power source furnishes the direct current for the electrolytic grinding action. Economical shaping of single-point carbide tools is completed on the offhand side of the machine by applying mild pressure on the tool against the rotating cathode. Current flow indicating the cutting action can be observed on the ammeter. Features include low diamond wheel wear, increased production rates since no pressure abrasion is required and elimination of tool rejection due to thermal cracking. These items make electrolytic grinding attractive as a productive process when tooling for competition.

Belt Grinding: Use of abrasive belts for grinding as well as the common application for a finishing operation has been accelerated by development of a number of machines comparable to abrasive wheel grinders. These machines include cylindrical and centerless types, with single and multiple heads.

Through-feed grinding of rod and

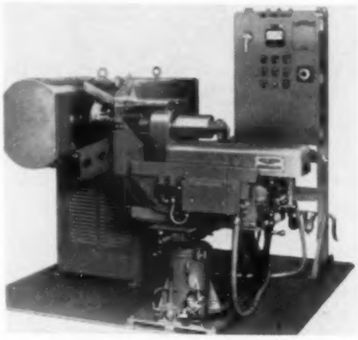
Optical projection grinder by Cleveland Grinding Machine Co. grinding a workpiece to a predetermined contour shown on the projection screen.



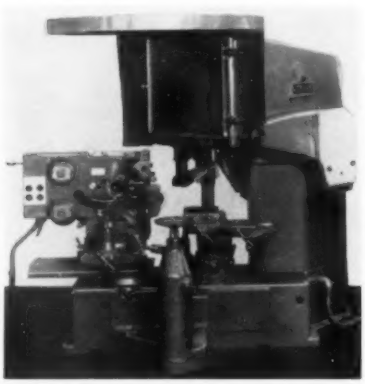
Centerless belt grinder by Engelberg Huller Co. for precision grinding and finishing of rod or tube stock by through feeding.

tube stock at rates of 4 inches to 40 fpm are possible on the new Engelberg centerless belt grinder. This machine permits heavy single-pass stock removal, fine microinch finishes and accuracy of 0.0003 inch TIR. Ferrous and nonferrous metals, as well as rubber, glass and plastics are easily machined by this machine. Other models of Engelberg machines have multiple heads, individually adjustable, for the complete finishing of workpieces from the roughing operation to the final polishing. Other features include pneumatic tensioning of the abrasive belts, variable-speed motors, one-piece beds, hardened and ground spindles and rapid-traverse heads. On some machines, conveyor belts carry the parts under the grinding heads at feed rates up to 46 fpm.

To obtain more throat depth for grinding awkwardly shaped parts, Hammond Machinery Builders have designed a small flexible belt grinder to solve these problems. These grinder-polisher machines can be equipped with a right or left-hand head, built-in dust collector,



The Osborn 3A-M machine with parts feeder for deburring and surface finishing.



Loewe optical profile grinder with a grinding head stroke and control determined by four pushbuttons.

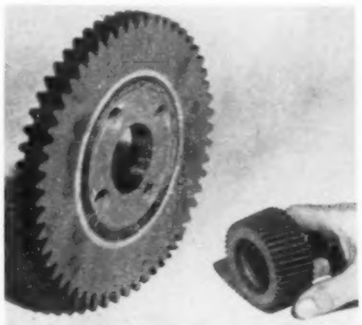
or a table to do plate and contour grinding. Another addition to the abrasive belt grinding field is the Hammond flat finisher for wet abrasive grinding, finishing and deburring of flat work. An endless conveyor belt makes it a high-volume continuous production machine.

Grinding of rubber rolls has presented problems to the machine builder and the wheel manufacturer. Conventional methods using bonded wheels, have presented problems of wheel loading and fire hazards from the machining of rubber in the dry state. Using the coated abrasive belts, Production Machine Co. has obtained fine surface finishes and high cutting efficiencies on a cylindrical machine using a water soluble coolant. It was found that the slower speed of 3500 sfm did not cut the softer durometer rolls as well as the faster speed of 8500 sfm. With idler back stand equipment, 168 inch belts can be used. Using the abrasive belts, the Production Machine Co. centerless grinding and polishing machines with single or multiple units make possible continuous production using hoppers or automatic feeding devices suitable for the individual application. Other machines include vertical and horizontal surfacing machines for sanding surfaces and straight-line finishing of wood, plastics, die castings, forgings and other similar products.

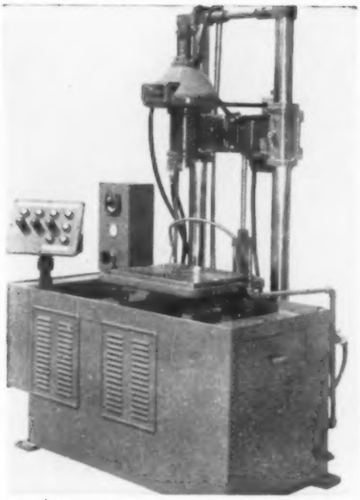
Power Brushing: Brushes have been used for cleaning of many types of materials for many years, before being applied to mass production operations. Today, most organizations in the materials processing field find their applications helpful for removing of burrs and rust, polishing, or for decorative surface finishes. To keep pace with the increased use of power brushes for process operations, the Osborn Mfg. Co. has developed the Brushamatic 3A-M machine, composed of standard components and a magazine parts feeder. Deburring, edge blending and surface finishing of a wide range of parts such as gears, pinions, coupling, fuel injection nozzles, motor stators and machine castings are processed through the machine in high volume. Production output for this machine is about 600 units per hour depending upon the brushing time required to finish each part.

With maximum workpiece sizes of 4 feet in diameter and 3 feet in height, the Osborn Brushamatic 51-2L machine is used for brushing OD's, end faces of disks and cylindrically shaped parts. Automatic cycling is a feature of this equipment which can be programmed to brush to a preset specification. Parts finished on this machine include aircraft turbine and compressor rotors, spacers, turbine buckets, large gears, sprockets and heat exchanger tube sheets. Each head is adjustable 240 deg around its horizontal axis, 360 deg around its vertical axis.

Honing: To meet the demands for finer finishes, honing has developed into a high-production process capable of removing material at high rates with resultant low microinch surfaces. To



Red Ring gear tooth honing tools made of abrasive impregnated plastic. The tool at the left is for external gears and on the right is for internal gears.

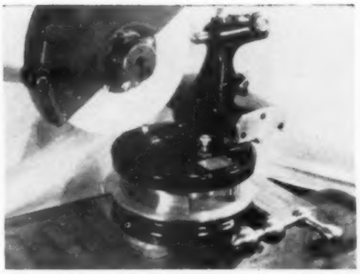


Superior vertical honing machine VA with the drivehead hydraulically controlled for stroking and maintaining constant pressure during stone expansion.

meet the demand for efficient machinery, Superior Hone Corp. has developed their horizontal and vertical honing machines with self-contained hydraulic systems. The system maintains constant pressure on stone expansion to assure no fall-off due to stone wear and stock removal. The horizontal machine has both foot and knee controls permitting the operator to stand or sit during its operation. The spindle can be controlled to obtain infinitely variable speeds from 250 to 1150 rpm. The vertical machine was hydraulically controlled stroking and may have the honing cycle controlled by an automatic timer from 6 to 120 seconds. Its spindle has an infinitely variable speed range from 225 to 550 rpm.

Honing has entered the gear machining field with the abrasive-impregnated plastic gear-shaped honing tools, designed by National Broach and Machine Co. The tools reduce the noise level of operating hardened gears, as well as improve the running characteristics of the gears by removing nicks and burrs. Many kinds of spur, helical and internal gears can be hard-finished with these tools.

Barrel Finishing: The challenge of reducing direct labor costs for finishing masses of parts has been answered by barrel-finishing techniques. Hundreds, even thousands, of parts are placed in a barrel-shaped container with a cutting media, e.g., wood chips, abrasive particles, etc., rotated a set number of turns which remove burrs and a predetermined amount of material. The Esbec Barrel Fnishing Corp. has redesigned its line of heavy-duty barrel-finishing machines to improve the performance.



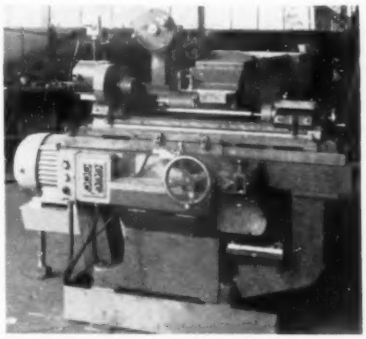
Jeon Mfg. Co. Model P-1 automatic angle tangent to radius dresser with a built-in sine bar arrangement for angular settings in seconds.

Featured are fast-action, lightweight safety doors, finger-tip operation, minimum floor space requirements and maximum load carrying capacities. These changes result in a lower cost per cubic foot of capacity.

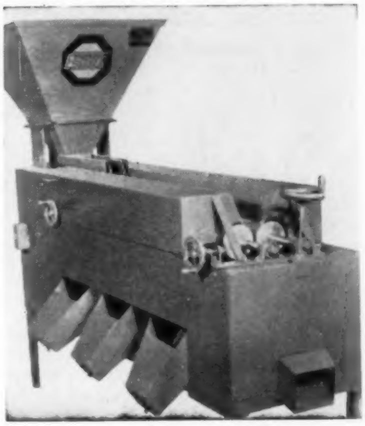
To supplement the barrel-finishing machines, two deck screening arrangements on the new Esbec Vibra-Grader permits three simultaneous separations of materials. It will not only separate processed parts from media but is fast enough to meet the heaviest production demands. The vibrator mechanism on the shaker unit avoids the violent action which would nick or scratch parts, but provides a useful motion that divides chips, gives a more uniform grading and prevents chips or parts from lodging in the screen.

In the separation of parts by size, the Esbec dimensional separator is able to make separations which cannot be done mechanically or by shaker screen. Rolls are deep hardened for longer life, have greater accuracy and will help make separations down to 0.0025 inch. Four separate discharge hoppers, combined with the ability to arrange the gap between the rolls in a V-shape, enable the machine to make up to four separations at one time. The hopper discharge arrangement helps to eliminate clogging.

Filing Machines: One of the most costly operations, from the standpoint



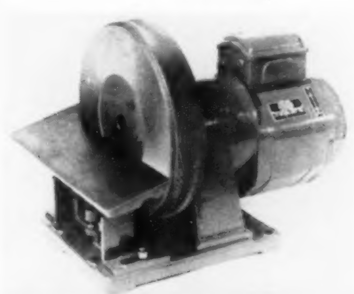
Production Machine Co. cylindrical belt grinder for workpieces up to 18 inches long and 4 inches in diam.



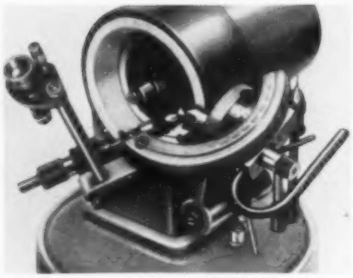
Side view of the Esbec dimensional separator showing the discharge chutes and the location of the controls.

of man-hours is the hand filing of sample parts, prototypes, models, or one-of-a-kind tools. To reduce these costs by quick and accurate removal of ferrous or nonferrous metal, as well as wood or plastics, the Jemco disk filing machine is a new addition to the Jersey Mfg. Co. line of labor-saving machine tools. Filing disks have cuts suitable for work being performed. For cutting nonferrous metals, disks are carbon steel. For ferrous metals, disks are high-speed steel or carbide with ground teeth which may be resharpened.

For deburring or facing small, light alloy castings, the Rindis filing machine, distributed by Newage Industries, produces a good finish, rapidly, without requiring coolant. The machine is designed to reduce costs on filing operations on many production, experimental or model operations. Filing, trimming,



The new Hudson R-filemaster for filing, shaping, or contouring any material that can be worked by a file.



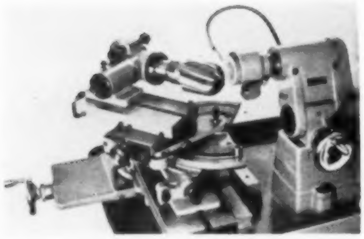
The Alina Corp. Amiet drill grinder for grinding drills from 0.012 to 0.250 inch with a point accuracy within 0.0005 inch. Any combination of lip clearance and included angles may be set up without difficulty.

chamfering, squaring and deburring are accomplished 6 to 10 times faster on the machine than by hand filing.

Attachments: To do the most efficient job of grinding, the wheels must be sharp because loaded wheels do not cut, they merely rub on the surface of the workpiece. The ultimate effect on the part could be thermal cracks due to the heat generated by the dull wheel. To alleviate this situation, American Coldset Corp. has developed a "wafer" diamond tool which can be used in its entirety. It gives a constant diamond area during the dressing life.

Dressing of grinding wheels to special contours has been a problem when it required a blended profile between a radius and a tangent angle. A unit to eliminate this break in the profile that occurs at the point of tangency is the Jeon automatic angle tangent to radius dresser. It is universal in application, since concave or convex profiles can be dressed as easily as straight lines. No templates or crushers are needed to obtain the desired contour. Only the adjustment of three dimensions is needed to obtain the desired position for repeat dressing of the wheel. A built-in sine bar arrangement allows settings finer than 5 minutes using gage blocks to obtain the desired split second accuracy.

For obtaining accurately ground radii, the radius grinding attachment for the Kuhlmann tool and cutter grinder does an excellent job. This unit, distributed by Eric R. Bachmann Co., can be used efficiently on all types of end and form tools requiring radii.



Radius grinding attachment for the Kuhlmann tool and cutter grinder with a tool in position for grinding.

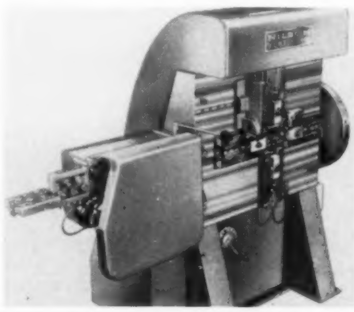
Presses and Press Equipment

One of the most recent innovations in press equipment is the vertical four-slide forming machine developed by the A. H. Nilson Machine Co. All forming is done in a vertical, rather than horizontal, plane. Departing from conventional means of actuating the forming slides, the Nilson design incorporates a drive shaft located behind the face of the machine. Forming roll slides have needle bearings and are placed in the center of the slides to give a centralized thrust from low-angle barrel cams mounted in the frame. This feature eliminates shaft spring. Lift-up and twisting is reduced to a minimum.

An advantage of the vertical arrangement is that the finished product is ejected to the front. Parts are not limited in size by the opening in the press bed, as is the case with conventional four-slide machines. Since the machine lends itself to discharging work onto rails, it is readily adaptable to automation processes. Other advantages are: greater accessibility of tooling, unobstructed view of the product as it is being formed, reduced floor space requirements and adaptability to magazine or hopper feeding.

The Vertiform handles wire up to 0.187 inch in diameter and ribbon metal stock up to 1¼ inch wide. Maximum lengths of standard feed is 15 inches.

Highly specialized requirements of the electronics industry have resulted in the development of a number of special types of presses. The Edward Segal NRTP tube pin and turret terminal setting machine, for instance, is designed to automatically feed and stake most types of pins and terminals used in printed-circuit boards.



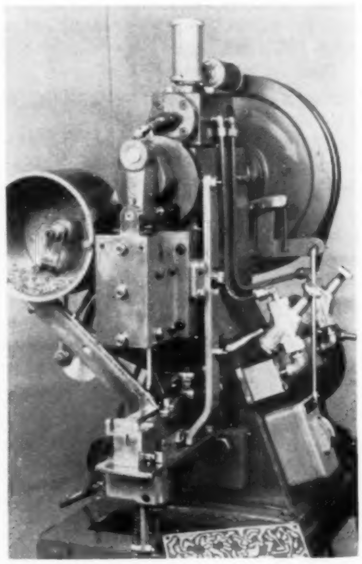
Vertical four-slide machine ejects finished parts to front. This Vertiform machine is adaptable to automation.

Tube pins or terminals are hopper-fed to a transfer mechanism where each piece is individually engaged in a holding mechanism. The assembly is placed on the tube pin or terminal prior to staking so that costly breakage normally encountered from misfeeds is eliminated. Production is 40 insertions per minute. Segal also makes an eyelet setting and soldering machine to fuse eyelets in place on printed-circuit boards.

Another specialized press is the EM-134 forming machine developed by the V & O Press Co., Div. of Emhart Mfg. Co. This press is designed to automatically blank and form a variety of packaging components from coils of sheet plastic. Depth of draw is 3 inches. Maximum part dimensions for rectangular parts are 9 x 11 inches. Circular parts up to 9 inches in diameter can be formed. Production is between 15 and 25 pieces per minute, depending on the size and complexity of the part.

By utilizing the "trapped sheet" method of forming, many plastic materials, from Polyflex 100 to the styrenes can be formed. A scanning unit makes it possible to process preprinted material and reduce process time.

With modern press equipment, tube bending is a high-production operation. The Model 6T tube bending press developed by Pines Engineering Co., Inc. makes as many as 3000 bends per hour. Two bends are made in each of two



Special Edward Segal press feeds and stakes pins and terminals in printed circuit boards.

Di-Acro press brake handles six-foot long workpieces.

tubes with each press stroke.

Wing dies, which wrap the tubes around the ram die, are mounted in slides to eliminate rubbing and marking of the tubes. They are adjustable, as are the ram dies, for different bend centers. Adjustments are also provided for quick setup.

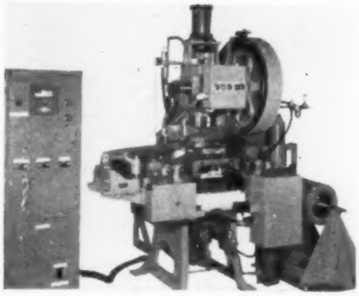
A second Pines machine, the Model 3T, can progressively form a series of bends with different angles and planes in a single piece of tubing. An automatic indexing turret provides the specific angle for each bend. Locating stops position the plane of each bend. Adequate clearance above and below the dies permits forming complex shapes at speeds up to 1200 bends per hour.

Another essential operation in the manufacture of tubular parts is piercing. The Koppy tube-pierce machine (Koppy Tool & Die Co.) is capable of piercing up to 600 round or irregular-shaped holes per hour. As the punch engages the work, tube and mandrel are held in rigid balance by the action of upper and lower compression inserts. This insures accuracy.

The mandrel remains permanently rigid with no deflection during the cut. There is no distortion of the tube after it is released from the mandrel.

As many as three standard heads can be mounted on a standard base for multiple piercing operations in one loading. Each head can be radially adjusted to 55 degrees either side of center. Heads are positioned longitudinally by sliding along keys in the base. The Tube-Pierce is made in two models. A 10-ton hydraulic power unit is provided to operate three heads simultaneously.

Hydraulic power is also used in the one and two-ton Multipresses built by Denison Engineering Div. of the American Brake Shoe Co. These presses are intended for operations such as assem-



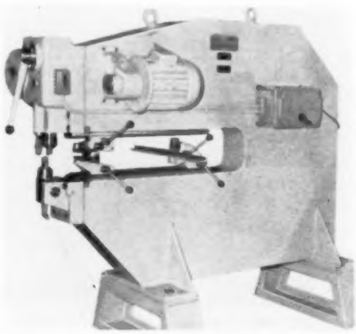
Automatic V & O press forms parts from sheet plastic blanks.

bling, riveting, punching, marking, trimming, pelleting, compacting, testing, straightening, broaching and swaging. Ram pressures from 500 to 2000 lb. are available with the one-ton model; ram pressures range from 500 to 4000 lb for the two-ton model.

Press brakes are among the most versatile items of production equipment. With proper tooling, they can be used for many types of simple forming operations, for multiple forming operations and even for deep drawing. Scharringhausen press brakes (Barer Engineering & Machinery Co. Ltd.) are made in both open-end and closed designs. Maximum pressures range from 40 to 984 tons, depending on the type and size of brake.

A new hydraulically operated press brake with six-foot length of bed and ram has been introduced by the O'Neil-Irwin Mfg. Co. The operator has complete control over the ram during forming and punching operations due to a stroke adjustment feature. The most practical length of stroke for each job can be preset. Ram speed of the Di-Acro brake can also be preset so that speed is reduced just prior to the instant the die makes contact with the work. This practically eliminates whipping and kinking of the stock.

Either shearing or forming operations can be accomplished on the Pullmax Model P-9 universal machine of the American Pullmax Co., Inc. The cutting capacity is up to 3/8 inch in mild steel and 1/4 inch in stainless steel. The machine can do straight, circular or irregular shearing, slotting, nibbling, louver cutting, beading, joggling, edge bending, flanging, dishing or planishing. Speeds are from 500 to 2600 strokes per minute.



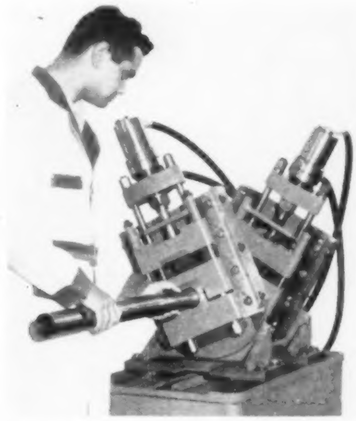
Pullmax universal machine performs both shearing and forming operations.

Punching and shearing operations are combined on the Vernet Model 241 Iron Worker (Machine Tool Manufacturers Affiliates), which can punch 1 x 1½-inch plate in mild steel, or shear 4 x 9/12-inch flat stock, 1 3/8-inch round stock or 1¼-inch square bars.

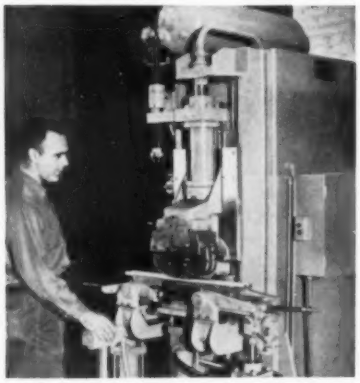
Peddinghaus universal steel workers (Upton Bradeen & James Inc.) are made in five sizes. They are capable of punching, shearing plates, and cutting rounds, squares, angles and T's without changing knives. Peddinghaus high-production billet shears can cut bullets up to 6 inches square and can also be used to cut round billets and flat bars of comparable area.

Press Automation: There are many accessory stock and parts-handling devices that improve the productivity of press operations. U. S. Tool Co., for instance, has developed a double roll feed for use with straight side presses. This feed can handle stock 12 inches wide. Feeding length is adjustable up to 12 inches. The unit, which can feed from either left or right, includes an eccentric-operated scrap cutter and an automatic stock oiler and wiper.

There are two models of the Surefeed press feeding device of the Producto Machine Co. Only two drive plates and a simple linkage, controlled by the movement of the press, are required to advance the stock. No press or feed alterations are necessary to mount the unit in an ordinary press. The unit can also be mounted on the die



Koppy tube-pierce machine is hydraulically powered, holds tubing and mandrel in balance during piercing.



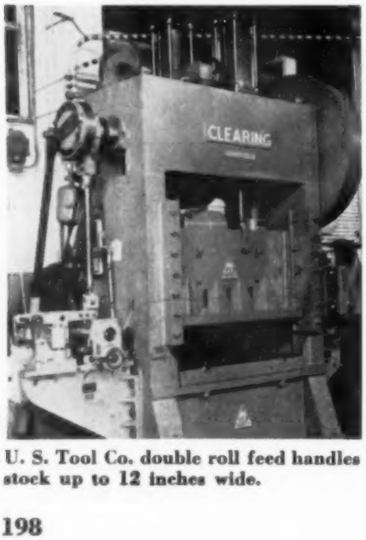
Pines tube bender can make 3000 bends per hour.

set so that the feeder and die set can be handled as a unit.

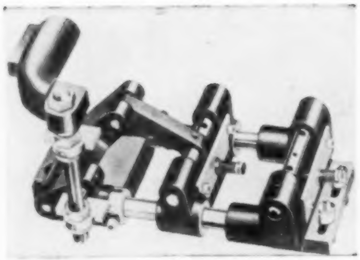
The smaller model handles stock two inches wide; the larger model takes three-inch wide stock.

A number of different types of friction type roll feeds, precision press feeds, stock straighteners and related items are furnished by the Durant Tool Supply Co. The Durant scrap chopper can be mounted in any position on the press bed with two bolts. Due to compact design, the chopper can be mounted close to the die, eliminating the possibility of buckled stock. The chopper is powered by the press ram and is independent of the die.

The Livernois transfer unit, Livernois Engineering Co., makes it possible to reduce die costs by grouping two or more dies together on a single die set and in one press. Handling costs are also reduced. These units are made in an A Model, with a transfer distance to 7 inches and a B Model with transfer distance up to 36 inches. Both units are powered by the movement of the press ram.



U. S. Tool Co. double roll feed handles stock up to 12 inches wide.



Surefeed press feeding device can be mounted on a die set.

A package unit for unloading sheet metal panels or forgings from presses in a straight line has been developed by Press Automation Systems, Inc. The unit is mounted on a portable A-frame type mounting and is equipped with the new Vac-Hand attachment which has an induced-suction rubber cup design that avoids marking of panels or moldings during handling.

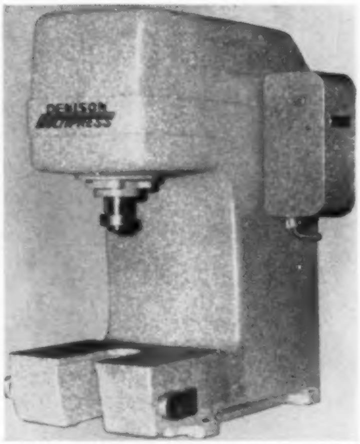
Press automation logically extends to safety devices. The Circuit Master Mark III control (Wintress, Inc.) provides automatic shutdown control for power presses. When stock misfeeds, buckles, jams, piles up or when a mechanical change in the shut height of the die occurs, this electronic control trips the power clutch control which stops press. An electronic compensator makes an allowance for temperature variations. The unit can be installed in one hour.

Toolroom Equipment and Supplies: Developing greater efficiency and productivity in the toolroom is one way of cutting die costs. When using a vertical mill to machine stamping dies, cams, forging dies, patterns, molds and similar items, setup time can be reduced with the Advance cross-slide rotary table. This table, built by Advance Products Corp. reduces setup time by 50 percent on simple jobs and up to 90 percent on complex jobs. Once the work is located and clamped on the top cross slide, it need not be reclamped until all cuts have been made.

The cross slide can be adjusted in a few seconds to position the work for cutting any radius whose center point lies within an 8-inch square area centered on the table. All dimension points are kept in relationship to each other.

Die handling is another area where costs can be cut, particularly where antiquated block-and-tackle methods are used. The Hansford Mfg. Co. makes die handlers in seven sizes. The smallest unit has a platen area of 14x26 inches. The larger unit has a lower platen area of 36 x 74 inches. This unit handles 600-lb dies.

The Hansford handlers are used to separate punch press dies, casting dies and injection molds. In operation, the die or mold is located in the die handler, the top platen is brought down to contact the work and both die sections are attached. Separation is accomplished by a motorized lift. After the upper die section has been lifted to the desired height, the top platen can be rotated with a hand crank.



One-ton Multipress can be used for assembly, testing and other operations.

Steel rule blanking dies have demonstrated their merit in hundreds of plants. They are economical to make and give satisfactory results in service. The cost of making such dies is reduced by the Multiform No. 6 hydraulic bender made by J. A. Richards Co. This unit has sufficient power to bend steel with a cross-section of $\frac{3}{16}$x2 inches.

Assembly of die sets can be a time-consuming operation. Improved die sets of the Producto Machine Co. have Quik-Fit guide pins. A spherical-angular radius on each pin makes it impossible for the die set to cock or jam, regardless of whether the punch holder is started straight or at an angle.

Richard Brothers Punch Div., Allied Products Corp. makes a number of die components that simplify die manufacture and maintenance. A new line of interchangeable pilot punches, for instance, is designed with radius points to quickly locate work in the press. The

Die set with Qwik-Fit guide pins is easy to assemble or disassemble.

punches have a ball-lock feature that permits quick insertion and removal from R-MB retainers.

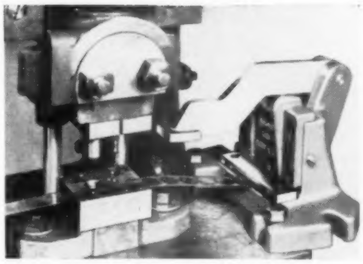
Die assembly operations are expedited by the R-B press-fit nuts which eliminate thread tapping yet provide required holding strength. Another product, removable dowel pins, facilites relocation of die sections and other die details when changing from one short run to another, or when replacing worn or damaged die elements.

Porter Precision Products Mfrs. makes a wide variety of piercing punches and dies. Their Pressfit Headtype and Bal-Lok interchangeable punches are made in round, oblong, rectangle, square, straight, pilot, extruding, countersinking, formed and other special shapes. Porter Custom Cone Leaders are made in a nib type and a No. 80 special, for punching geometric shapes through heavy metal thicknesses and materials such as titanium, stainless steel and other hard-to-pierce metals.

In some instances it is possible to perforate, rather than drill, holes through steel rods, with obvious savings in time. Durable Punch & Die Co. has developed perforators capable of punching holes with the same accuracy as drilling operations. A telescoping sleeve supports the punch through the entire stroke. A typical application is punching an 0.040-inch diameter hole through 0.095-inch thick steel.

Jektole piercing punches, with companion insert dies, are designed for fast punch sharpening. They are a new development of Dayton Perforators, Inc.

Dies: When producing short-run parts with a large number of holes, the holes are often individually drilled to save the cost and time of producing a piercing die. Magnetic perforating die equipment developed by S. B. Whistler & Sons, Inc., reduces piercing die costs. The Whistler system consists of a basic die set with permanently



Durant scrap chopper is mounted on press bed with only two bolts.

mounted posts to hold locating templates. A separate locating template is made for each job.

Reusable punch and die retainers, holding removable punches and die bushings, are positioned by means of the locating templates. Permanent Alnico magnets in the punch retainers grip the punch shoe of the die set, providing square alignment of the punch and relieving the locating template of the retainer weight. Strippers are self-contained and mounted on the individual punches.

The equipment can be used in almost any press having a shut height of $9\frac{1}{2}$ inches or more. With standard strippers, $\frac{1}{8}$-inch thick mild steel can be punched. With heavy-duty strippers capacity is $\frac{1}{4}$ inch.

Brehn Shimmy Dies (Vulcan Tool Co.) are used for trimming many different shaped parts. The dies can be changed over from one part to another by changing the cutting members, which consist of a punch plate assembly, die plate and shell ejector. Change-over can be accomplished in 15 to 60 minutes, depending on the die size. The dies trim to close tolerances and burrs are negligible. Small parts have been trimmed at the rate of 1350 per hour. These parts were hand loaded and air ejected. Using an automatic loader, similar parts are trimmed at the rate

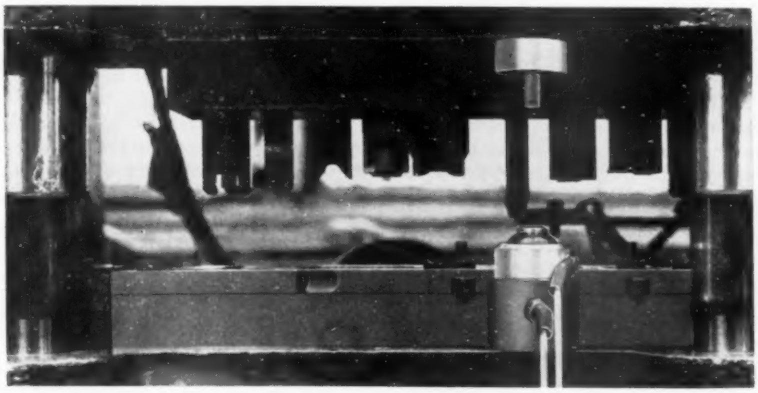
PAS package unit utilizes suction to hold panels during unloading.

of 4200 per hour in a two-station die. Large parts such as refrigerator doors are trimmed at the rate of 400 per hour with hand loading and unloading. The dies can be used in virtually any mechanical or hydraulic press.

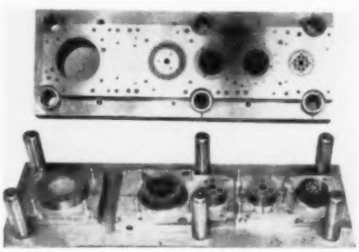
For high-production blanking and piercing, carbide dies offer long life and minimum maintenance. Dies built by Oberg Mfg. Co., Inc. give almost ten times the production of steel dies between sharpenings. Some of these dies produce a million parts before sharpening is required.

Chemicals and Fluids

Fluids for general machine cleaning as well as for cleaning coolant and hydraulic systems are necessities in modern production. For assuring maximum performance from a machine and its auxiliaries, Anderson Oil and Chemical Co. Inc., has developed a practically odorless Winsor machine cleaner. It is mixed in proportions of one part cleaner to 25-50 parts water and combines effective ingredients which kill all bacteria present on a machine, in the coolant sump and in the coolant pump, pipes



Close-up view of the mechanical sensing unit for the Wintriss Circuit Master Mark III. This sensing unit operates on a "no contact" principle, shutting the press off when it does not close to its complete shut height.

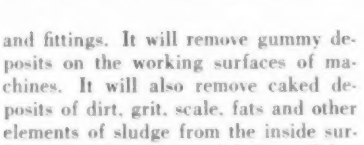


Carbide lamination die built by Harig Mfg. Corp. has interchangeable sectionalized construction. A typical run is one million blanks before resharpening is required.

Progressive triple rotor-stator die made by Oberg Mfg. Co., Inc., produces three rotors and three stators with each stroke of the press from a single width of silicon steel six inches wide.

and fittings. It will remove gummy deposits on the working surfaces of machines. It will also remove caked deposits of dirt, grit, scale, fats and other elements of sludge from the inside surfaces of coolant lines and fittings. Other products developed by Anderson Co. include cutting fluids as well as germicides, rust preventatives, and water conditioners. These water-based coolants solve critical cooling problems of the high speeds and feeds used today.

Compounds, developed by United



Small Brehm Shimmy Die trims aluminum cups in one operation.

Tool Co., speed metal removal in machining, tapping, planing, shaping and milling operations. The compounds are solubilized condensates of sulfur, chlorine, sperm oil and heavy-duty, high-flash paraffin oils. Materially increasing tool life, the fluids react chemically with the metal in its semiplastic state at the point of cut. This action is said to be of a two-step nature, involving release of atomic chlorine at temperatures to 500 F and sulfur monochloride at temperatures beginning at 375 F. The chlorine and sulfur triggered at these temperatures are said to react under the heat generated to pack the crystal lattice structure of the workpiece at the tool interface. The unusual results obtained are explained as an effect of stressing or brittlizing action, reducing the plastic deformation.

Tap magic, a compound for tapping, threading, drilling and reaming, developed by The Steco Corp., reduces surface tension, stress and metal-to-metal adhesives set up in the course of machining. It prevents clogging of work-hardened chips and evaporative action cools the cutter, preventing expansion.

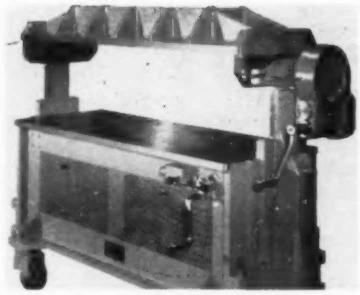
Materials

Continuing improvements in materials have led to economies in manufacturing, as well as to better products. The introduction of Vanadium-Alloys Steel Co.'s VascoJet 1000 ultrahigh strength steels is a case in point. This material has high-strength properties at both room and elevated temperatures. It is relatively stress-free and can be fabricated and hot or cold-worked easily. Production processes that can be used are forging, deep drawing, extruding, rolling, spinning and machining.

Vanadium Alloys also makes high-speed steels for tooling applications, ground steel flat stock, drill rod and special shapes, and die blocks. Prealloyed metal powders are another useful and cost-saving product.

A new method of hard-facing metal surfaces for protection against abrasion and wear has been developed by Kennametal, Inc. The facing material consists of small hexagonal plates of cemented tungsten carbide assembled on an adhesive glass-fiber backing. The adhesive backing holds the small plates in position while they are being bonded to flat or curved surfaces with epoxy adhesives, silver solder or conventional brazing materials.

The flexible backing simplifies application since the sheets can be cut or joined in multiples to form practically any required size or shape. Two sizes of hexagons are being made. Thicknesses are $\frac{1}{32}$ and $\frac{1}{8}$ inch for 0.200-inch plates and $\frac{1}{16}$, $\frac{1}{8}$ and $\frac{1}{4}$ inch for 0.500-inch plates. Thin plates are recommended where the surface is not sub-

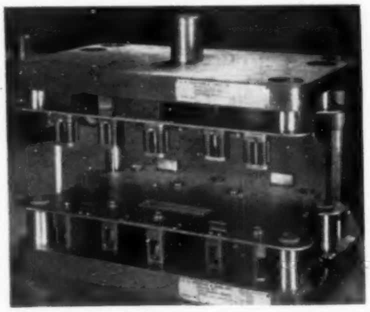


Hansford die handler facilitates die assembly and maintenance work.

jected to impact and where abrasion is not extremely severe, as on machine tool ways. The thicker plates are recommended for applications where the surface may be subject to impact.

The cermets—a relatively new family of cutting tool materials—are giving excellent results in production. Firth Sterling, Inc. has introduced a new cermet grade, Firthite WF. This material has a titanium carbide base with molybdenum carbide additions, using nickel as a binder.

With the new material, it is possible

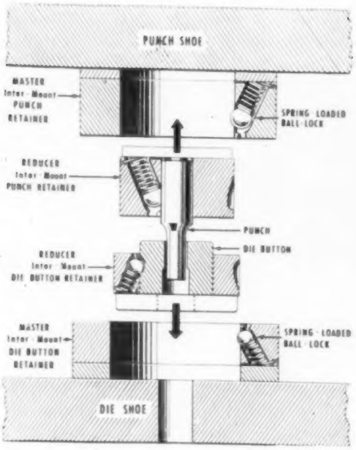


Whistler magnetic perforating equipment can be set up by semiskilled labor, using a simple template.

to operate at cutting speeds far in excess of those obtained with tungsten carbides. Further, it can be used to cut steels having low machinability indexes, where conventional ceramics would fail because of lack of strength.

Another material that has been developed for tooling is magnesium. The advantages of magnesium for tooling applications are lightweight and excellent machinability. Magnesium tooling plate, for instance, weighs only 25 percent as much as equivalent steel plate and can be machined many times faster. The Dow Chemical Co.'s Madison Div. furnishes magnesium tooling plate in $\frac{1}{4}$ to 6-inch thicknesses, up to 60 inches wide and 144 inches long.

Low-melting-point materials are valuable for making reproductions of surface finishes and contours. The Alloy

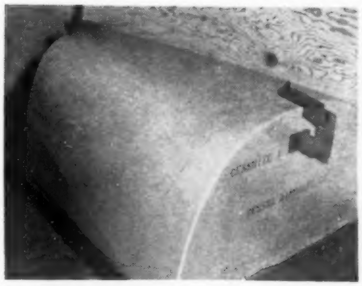


R-B Inter-Mount punch and die button retainer sets reduce press down time required for changing retainers.

Dept. of Cerro de Pasco Sales Corp. produces low-temperature melting bismuth alloys that can be applied with an electric spray gun. They have also developed a technique of soldering glass and metal and a slush casting method for producing molds for encapsulating with epoxy resins. Electric and gas heated spray guns and electric melting equipment are other products of this department.

Improved quality control procedures by specialty steel manufacturers have resulted in more uniform and better products. This is true of the Carpenter Steel Co.'s Vega, an air-tough alloy for such uses as large dies, feed fingers, shear blades and mandrels. Vega was developed to fill the need for a material with the deep-hardening characteristics of an air-hardening steel and the simplicity of low-temperature heat treatment found with oil-hardening steels. Like other steel producers, Carpenter has a number of related steels for die applications. Specifications and characteristics of each of the 12 Vega steels dovetail so closely that the user can anticipate the results when changing from one to another.

Epoxy resins have proved their worth for jigs, fixtures, hammer forms, draw dies, and stretch dies used in the automotive and aircraft industries. They make it possible to meet competitive deadlines and conserve capital investment by taking advantage of cost and time savings as high as 80 percent. Maraset resins made by the Marblette Corp. are used for small parts, as well as for huge metal-forming blocks. Some new developments by this company are high-density resins for use as shields against radioactivity, resins with high strength and abrasion resistance at elevated temperatures (making it possible to fabricate plastic injection molds), and resins combining resilience with rigidity.



Stretch die of Maraset epoxy resins was fabricated in a single working day at the Cessna plant in Wichita, Kan. Cost of materials was about 87 percent lower than the comparable metal tool.

Maraset protective coating resins, another recent development, are used as undercoats for plastic tools and to extend the life of plaster molds and patterns during use.

Illustrating the versatility of plastics for tooling, Reichhold Chemicals, Inc., has listed some of the applications for their Polytool plastic tooling compounds. They are used for dimensional control applications, including master models, duplicating models, spotting racks, gages and checking fixtures. Metal-forming applications include hand form blocks, spinning chucks and drop hammer dies, as well as stetch press and draw dies.

These plastics are also used in assembly jigs, welding fixtures, trim fixtures and vise and chuck jaws. In finishing operations, they are utilized for polishing chucks and paint spray masks. Foundry uses include patterns, match plates and core boxes.

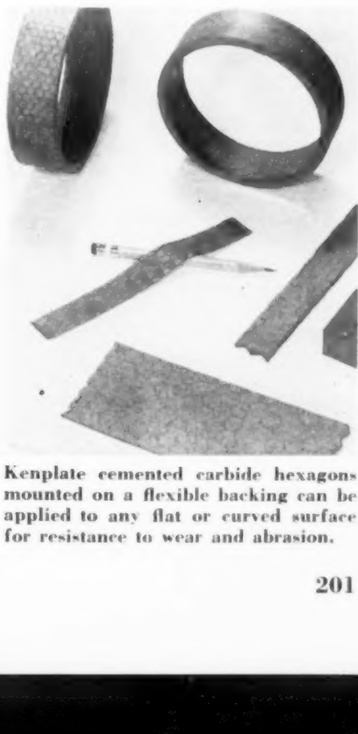
Magnesium tooling plate can be readily machined. Here a kellering template is being machined from two-inch tooling plate. Total cost is less than one-quarter the cost of a steel template.

Another interesting application of plastics is as a protective coating for metal parts and tools, and to mask parts prior to plating. Bischoff Chemical Corp. has developed several Thermo-Cote strippable protective coatings.

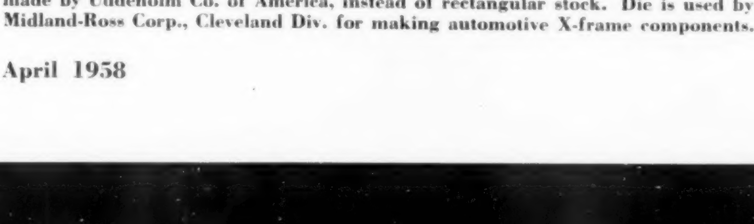
The plating mask is easily applied. Prior to plating, the part is dipped in a bath of liquid plastic at about 350 F. The resultant coating dries within 60 seconds. It can then be cut to the desired "stop-off" lines with a sharp knife or razor blade. After the plating operation is completed, the coating is peeled off. The plastic can be reused.

Equipment Accessories

The utilization of the proper equip-



Kenplate cemented carbide hexagons mounted on a flexible backing can be applied to any flat or curved surface for resistance to wear and abrasion.



Blanking and perforating die incorporates water-hardening tool steel sections, made by Uddeholm Co. of America, instead of rectangular stock. Die is used by Midland-Ross Corp., Cleveland Div. for making automotive X-frame components.

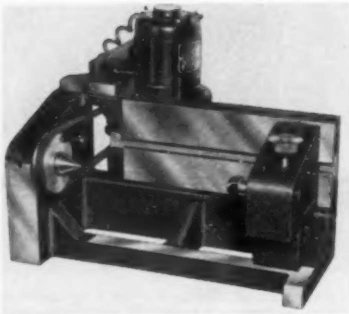
A Precise power quill for production grinding, milling and finishing precision parts. Unit develops spindle speeds up to 45,000 rpm with ½ hp.

ment accessories can increase production, provide more versatility and reduce change-over problems. Accessories can be applied to existing machines, making them more useful, or can be used as the building blocks of special-purpose machines.

Precise Products Corp. has added to their line of power quills three new high-torque superspeed power quills for volume production applications. These new power quills are expected to find wide application in the missile and rocket programs as well as in other types of manufacturing where precision machining is of importance. The tools have speeds from 35,000 rpm to 45,000 rpm and are completely self-contained with motor and drive designed as a single integrated unit which is free from chatter and vibration. For special production applications, the tools can be mounted on any standard or special machine tool by means of standard mounting brackets.

To add greater versatility to the power quills, a newly designed extension spindle can be applied for finishing deep cavities in dies and castings. The extension spindle can be adapted to any standard quill without loss of torque, speed or precision.

Grinding: Jobs not normally handled on a surface grinder can be set up easily and ground accurately with a motorized center unit made by AA Gage Co. The live center is mounted in a precision ball bearing and is driven by a ¼-hp motor through a speed reducer.



Many different jobs can be handled on a surface grinder with this motorized center developed by the AA Gage Co.

The normal center speed is 78 rpm. By the use of a heavy-duty rheostat attachment, speed can be varied to achieve exact grinding speeds for different materials and diameters.

Either a high-speed steel or a carbide dead center is held in a movable slide. Approximate center distance is obtained by moving the slide and locking it with a T-bolt. Fine adjustment of the dead-center position is made by a rack and pinion after the workpiece is inserted.

The cast-iron frame is accurately finished on both the bottom and one side so the unit may be used either vertically or horizontally. Tapers are ground by using a sine plate.

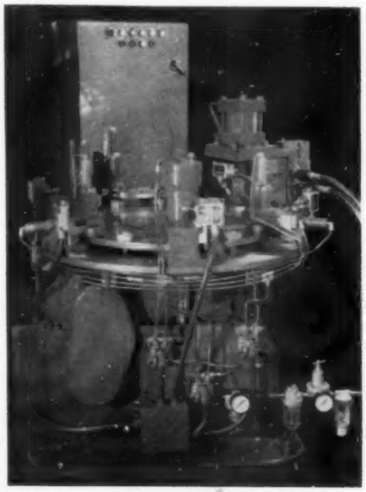
A Torit collector for reclaiming diamond dust from grinding operations.

The Hammond Junior dust collector requires a minimum of floor space and can be placed almost anywhere. It operates on the principles of centrifugal precipitation for smaller particles and gravitation for the removal of larger particles. The smaller particles can be exhausted outdoors or trapped in a bag.

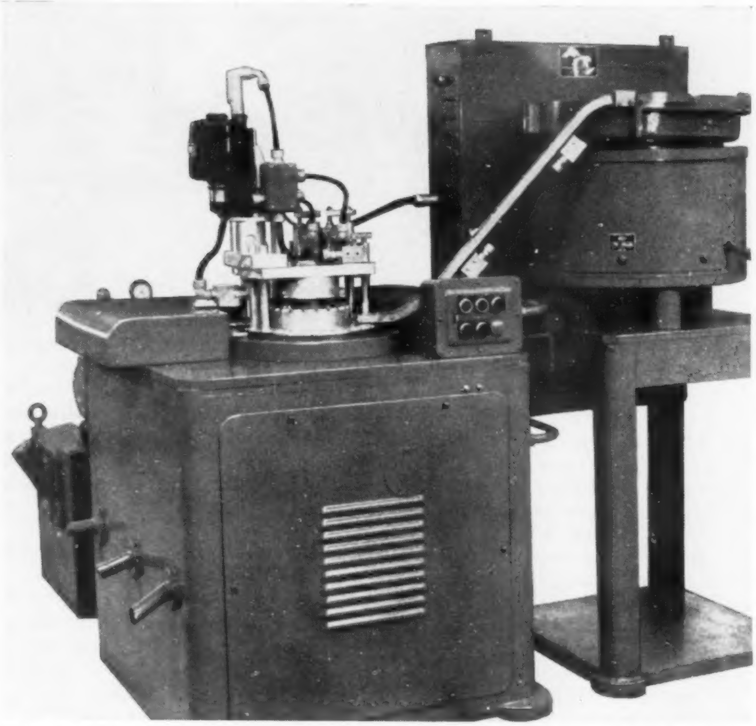
Diamond reclamation in the toolroom and the machine shop is a profitable undertaking. A new collector, designed by Torit Mfg. Co. can be used for installation in either a central collecting system or with unit type systems. The unit is adaptable to any type of diamond wheel grinding whether mist, wick or dry grinding. The collector deposits the diamond bearing dust in a clear plastic container where it can be visually inspected. Since it is impractical to reclaim dust that has been contaminated with residue from other than diamond grinding wheels, the unit is equipped with a by-pass valve. This allows grinding wheels if other types of wheels to be used on the same grinder.

A compound-angle collet indexing and grinding fixture made by The All Tool Co. can be used for flat and cylindrical grinding, light milling, drilling, indexing and inspection. The fixture accepts standard collets up to one-inch capacity and can be swiveled through 360 deg in two planes.

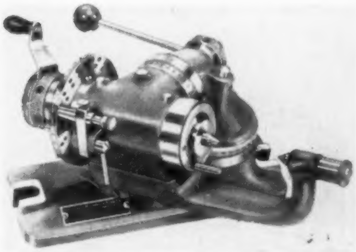
Indexing Mechanisms: Improvements in standard components for special machines have increased and simplified applications. Ferguson Machine Corp. has introduced a new combination index table and punch press. The table and press have been integrated for automatic assembly operations. The press has a ten-ton capacity with a stroke of two inches and can be electrically interlocked with the table for single-stroke operation or mechanically timed for high-speed production. It is designed with especially long ram guides to eliminate the need for subpresses except in cases requiring unusual accuracy. Access to crankshaft, slide, pitman and dies is provided from the side away from the dial to simplify die installation



Rotary transfer machine, by Ferguson Machine Corp., having a 36-inch dial, 12 stops and 270-deg indexing period assembles 30 skate wheels per minute.



This hydraulic center post index table, built by Inter-Lakes Engineering Co., can be used for assembling, deburring, drilling, riveting and chamfering.



A compound-angle indexing and grinding fixture which can be used for a variety of operations. Parts are rotated by hand during operation.

and maintenance. Other developments for press applications include dial transfer and coil stock feeds indexed by a roller gear drive.

As a standard accessory for the basic indexing chassis offered by Swanson-Erie Corp., an overhead tool mounting plate which moves vertically is available. The plate is mounted on a post projecting through the stationary center place, and completes one vertical cycle during each index cycle of the turret. It provides for tool mounting at any point around the turret.

Vertical motion of the center post is by cam actuation and is directly tied to the index drive of the chassis. No additional motors or drives are required. The vertical motion occurs when the turret is in the dwell position. The tooling plate remains stationary at the top of the stroke while the turret is indexing.

The basic chassis can also be furnished with a continuously rotating vertical camshaft projecting through the stationary center plate of the turret. This shaft makes one revolution per turret cycle and permits mounting operational cams for horizontally operated tooling devices at any turret station.

The Inter-Lakes Engineering Co. automatic index table is available with either a mechanical or hydraulic drive. The machine can be used for secondary machining, chamfering, side drilling, burring and small assembly work. Parts can be assembled and fastened by riveting, welding or pressing. This type of machine can also be used for automatic inspection. The dial is open all around making it possible to hopper feed at any part of the dial. The top plate and dial are removable. On low-production work, conversion from one job to another can be accomplished by replacing the plate and dial with one that has been suitably tooled.

Special Control: New developments in automatic control have increased applications manyfold. Used with either standard or special machines, these control systems can bring about savings in setup time, machining time and fixture cost.

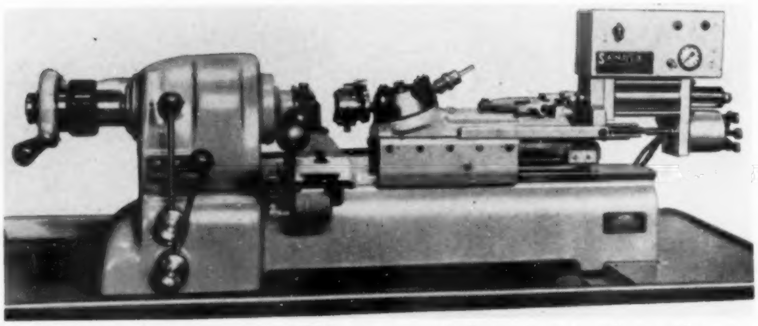
The Electropoint control of Electrosystems, Inc. is an all-transistor system, is currently in operation with turret drill presses but is adaptable in principle to other uses. The control employs continuous measurement throughout the entire range of movement. The digital measurement is determined only by the instantaneous machine position and is independent of past movements, power failure or starting position.

Display of the machine position is in direct reading decimal form to 0.001 inch. Information for preparation of the tape is made possible by the display. The table is moved manually until the correct spindle is in the appropriate hole of the prototype part whereupon the X and Y coordinates and the machine function information are recorded on punched tape by the operator.

A Warner and Swasey tape-controlled positioning system is manufactured in two types. One type is directly applied to a leadscrew, rack or worm drive. It consists of a control console and one or more locating units which are attached to the drives. Additional basic locating units can be added to the system to provide unlimited rotary and linear movements.

The second type consists of a control console and a pilot unit which incorporates as its actuating element a basic locating unit. The pilot unit is not attached to the driving means but is installed analogous to a scale on which dimensions are preset and controlled

Turret indexing chassis manufactured by Swanson-Erie Corp. Overhead tool mounting plate moves up and down during indexing cycle of the turret.



Sandex turret lathe converter. This converter indexes turret and provides controlled power feeds both in and out.

Warner-Swasey tape-controlled positioning system is built of modular units for flexibility.

by the locator system.

Applications include jib borers, jig grinders, boring mills, measuring machines, gun drilling machines, and rotary and rectangular coordinate tables.

In keeping with the trend toward modular construction of special machine tools, the Standard Electrical Tool Co. has developed a two-dimensional ball bushing positioning table for operation with tape control units. The table can be applied to many different types of metal-cutting methods. A major advantage is the time saved by eliminating jigs and fixtures, especially in shops where varying production requirements are found.

A standard turret lathe can be converted to automatic by application of a Sandex Automation, Inc. converter. The device indexes the turrent through a full cycle automatically. The unit is air powered and each station has its own individual feed adjustment. The converter uses mechanical feed stops of the machine to insure accuracy. A cushioned feed compensates for hard and soft spots in the workpiece, extending tool life.

One model provides controlled feed only and another, both controlled feed and return. In addition to lathes, the converter may be mounted on drill presses, milling machines, grinders or any machine where a power feed is desirable for finer control.

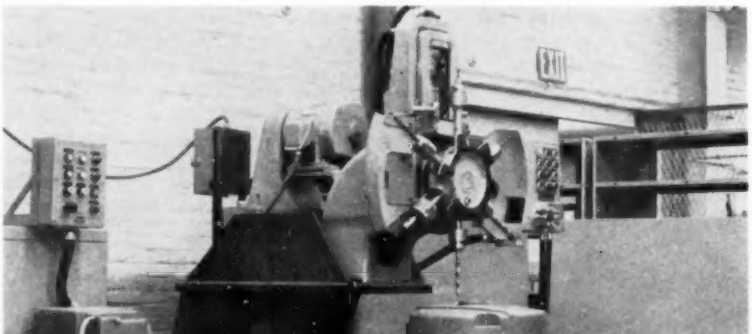
Miscellaneous Accessories: A speed changer with a variable range and a 6.5:1 ratio is produced by The Custanite Corp. Using a self-compensating floating pulley arrangement, the changer permits changing machine speeds instantly without stopping the motor. The changer is ideal for drill presses, machine tools, power and feed controls, conveyors, timing and experimental devices requiring frequent changes.

A spacer for straddle milling eliminates shims and washers. The steel used is heat treated carefully to prolong accuracy. A micrometric scale for adjustment is graduated to 0.0005 inch. The spacer is manufactured by The O.K. Tool Co.

The operation of punch presses and other impact metal forming machines may transmit vibration to nearby precision machinery. This may damage the machines or make precision finishes difficult to obtain. By the use of vibration mounts produced by Robinson Aviation, Inc., the machine vibrations are eliminated. Another advantage is that the damping effect causes a press to settle down more quickly between strokes permitting faster operating speeds.

Vibration mounts used on precision machines help eliminate vibrations from outside sources such as traffic in the vicinity of the plant. The mounts are of all-metal construction consisting of thousands of interlocking stainless-steel springs. Featuring a simple built-in leveling device, the mounts can be installed without special tools. No lagging to the floor is necessary; thus the machines remain mobile for easy rearrangement.

Efficient holding and moving of heavy loads are easily accomplished by means of the Chicago Tramrail Corp. "Trak-



Numerical tape-controlled drilling machine with Standard Electrical Tool Co. two-dimensional ball bushing positioning table.

rak" crane system. Making use of various grabs and forks, such items as barrels, sheet steel, or bar stock can be picked up and carried from the storage area to the point of use, using only one man for operation of the unit.

Machine Control Components

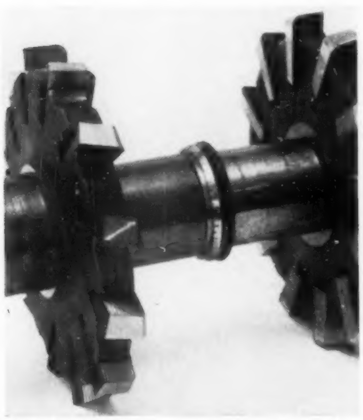
Many advances in production during the past few years have been made possible by the development of compact and powerful components of hydraulic and pneumatic systems. Recently, the desirable characteristics of both types of systems have been combined.

Mead Specialties Co., for example, has developed an improved air-hydraulic drill-press feed. Power supplied by a double-acting air cylinder is regulated by a small hydraulic cylinder and hydraulic speed-control valve. The air cylinder supplies pressure for the downward feed of the drill and returns it to the starting point after it has reached a preset depth. A system of hydraulic checks maintains a uniform speed, regardless of soft spots or break-through points, yet allows rapid approach to the work.

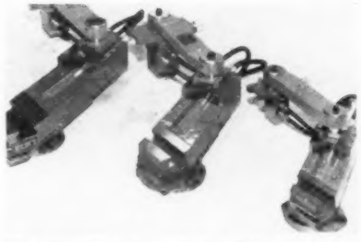
The rate of feed can be determined by a calibrated gage and pointer on the speed control valve, and adjustment can be made while the machine is in operation. The adjustment is coarse—one full turn of the adjusting knob is required to change the feed from 4 to 5 ipm at 50 psi.

The Mead drill-press feed can be attached in a few minutes to any standard drill press having $3\frac{1}{2}$ or $2\frac{3}{4}$-inch-diameter cylindrical columns and $2\frac{1}{4}$ or $1\frac{3}{4}$-inch-diameter spindles. Two rollers, both bearing on the drill-press column, compensate for side thrust against the spindle or quill. These steel rollers ride on their own tracks to avoid wear on the column.

Mead also makes an air-powered indexing table that has a positive locking



O.K. Tool Co. spacer for straddle milling eliminates shims and washers. The adjustment reads to 0.0005.



The three styles of the Mimik tracer valve assemblies, designed by Retor Developments, to convert standard lathes into tracer-controlled units. Control range of 360 deg of the tracing head makes re-entry on the template possible for facing and undercutting.

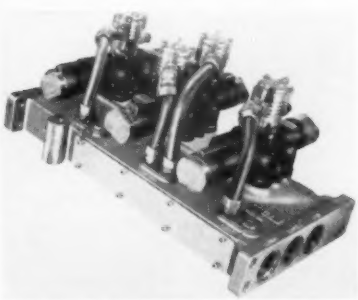
mechanism for accurate positioning. This locking system is mechanical and stays locked if the air supply fails. The 14-inch-diameter turntable forms a sturdy base for large dial plates.

Pneumatic vises, power heads and a new pneumatic crimper are manufactured by Production Devices Inc. These devices can be operated manually, or can be automated as part of a machine cycle using cam or solenoid valving.

The pneumatic vises can be used singly, or in sets or series. All vises in a set are machined so that the fixed jaw casting faces are in alignment and the vise beds are in the same plane. Thus all vises do an equal amount of gripping on the workpiece. Several types of these vises have keyways machined across the false jaw faces so that false jaws can be keyed and pinned in place for extreme fixture accuracy.

The pneumatic crimper was primarily designed to crimp solderless electric terminals. It is also used as a 2-ton press and for staking operations. Standard controls include a foot valve for manual operation.

Valves: No pneumatic or hydraulic system can be any more reliable than the least reliable of its components. Recognizing this fact, all component manufacturers are constantly working to improve their products. Many manufacturers are also working on ways to decrease the package size of valves,



Valvair manifold holds two single and one double Speed King valves.

cylinders and other components. Denison Engineering Div. of American Brake Shoe Co. has developed a new line of pilot-operated solenoid-controlled 4-way valves that are shorter in length than conventional valves. These valves meet all JIC requirements and provide porting and positioning arrangements on circuits up to 3000 psi. They are interchangeable with all comparable valves now in use.

Other design features include use of internal retaining cords to secure covers to valve bodies and, as an option, adjustable pilot chokes for smooth reversal. Capacities are 30 gpm for the $\frac{3}{4}$ inch pilot and 5 gpm for the $\frac{1}{4}$ inch solenoid.

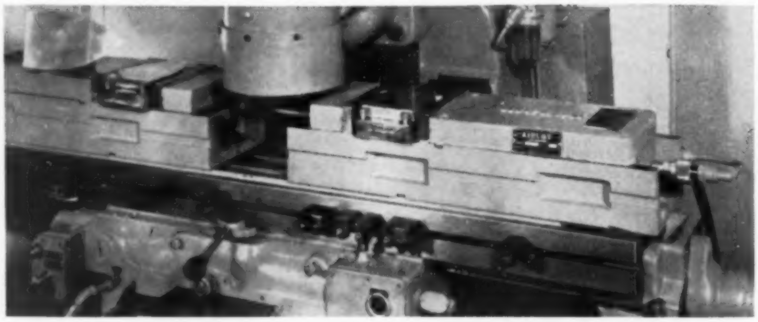
Maintenance has been taken into consideration in the design of the Ross Operating Valve Co.'s Skyline series of valves. The Gold model has an oil-immersed solenoid with locking manual actuator. This model conforms to JIC standards and has a tested life of more than 40 million cycles. The Silver model spool solenoid pilot valve also conforms

Air-hydraulic drill-press feed developed by Mead Specialties Co. A double-acting air cylinder provides power, while a small hydraulic cylinder and speed-control valve regulates the stroke.

to JIC standards and has an operating life of more than 25 million cycles. A White model has been tested to more than 20 million cycles. Sequencing valves are included in the Skyline series. All of these valves have interchangeable heads and bodies.

Production experience has demonstrated that manifold mounting of valves reduces maintenance problems and makes a more compact installation. The cast-aluminum manifolds produced by Valvair Corp. are made in two and three-station types and have full-length inlet and exhaust ports common to all stations.

A conduit passage for electrical wiring, with a cover providing access for



Two Airlox pneumatic vises mounted on a vertical milling machine so that one vise can be loaded while the work is being machined in the other vise.

maintenance, runs the full length of the manifold. Dirt and moisture-proof flexible conduit encloses the pilot silenoid leads. To facilitate piping, manifolds are machined for both side and bottom cylinder porting. By putting two or more assemblies together, end to end, manifolds can be ganged to provide compact mounting of six or more valves.

In addition to the new manifold, Valvair manufactures Speed King single and double solenoid pilot-operated valves, as well as other electrical, pneumatic and hydraulic valves.

Installation and service time are cut by the Valvair Speed King plug-in type ¼-inch control valves. These valves are fitted with built-in plugs and connectors that complete electrical connections as components are bolted into place.

Valve chambers of BJ type pneumatic valves of C. B. Hunt & Son are formed by aluminum spacers held in accurate metal-to-metal end abutment. This arrangement permits the O-rings and U-packers to be supported on both the inside and outside diameters without placing any mechanical pressure on the packers. The hollow, radially ported stainless-steel plunger is the only moving port except for the operating mechanism. Flow is from the inlet chamber through the radial ports of the hollow plunger and out through other ports to the connected line. There is no direct impingement of flow across the packing, so valve life is prolonged. All parts are in "pressure balance," eliminating any tendency to creep or crawl.

These valves illustrate the high speeds attainable with modern valve design; they are conservatively rated at 600 cycles per minute at pressures from 40 to 150 psi and can be operated intermittently at much higher speeds.

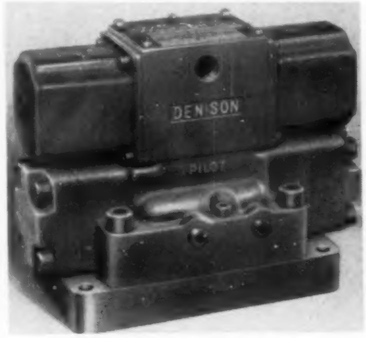
Similar design features are found in the Hunt CJ valves, intended for use with air pressures to 125 psi where ambient temperatures do not exceed 150 F. Solenoids of these valves thrust directly against valve plungers. Only momentary energization of the solenoids is required to reverse the position of the valve plunger. Valves for 60-cycle current can operate at speeds up to 600 cycles per minute.

The 2 and 3-way solenoid valves produced by Automatic Switch Co. were designed with simplified maintenance in mind. These valves are intended for mounting on a manifold. The manifold mounting makes it possible to remove and replace individual valves as needed. Any combination of 2-way and 3-way valves can be mounted on an individual manifold. The manifold construction provides common pressure and exhaust connections.

In addition to these valves, which are intended for use with air, gas, water, light oil and other fluids, Automatic Switch Co. manufactures a variety of valves and a line of Asco electrical relays for circuit or load control.

Cylinders: Specifications for the power cylinders used in tooling for automotive production are rigid. The Logansport Machine Co. has developed a new line of air and hydraulic cylinders that meet these specifications. Some of the features of this series are extra-heavy steel covers, long rod bearings, cushioning arrangements and protective finishes.

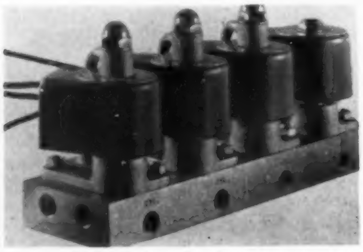
Another Logansport item is a self-locking drawbar used in conjunction with power chucks, mandrels and collets. The clamping device is held in closed position in the event of a power failure. Logansport Machine Co. makes a number of other fluid-power components, including air cylinders, hydraulic cylinders, valves and power devices, power chucks and air arbor presses.



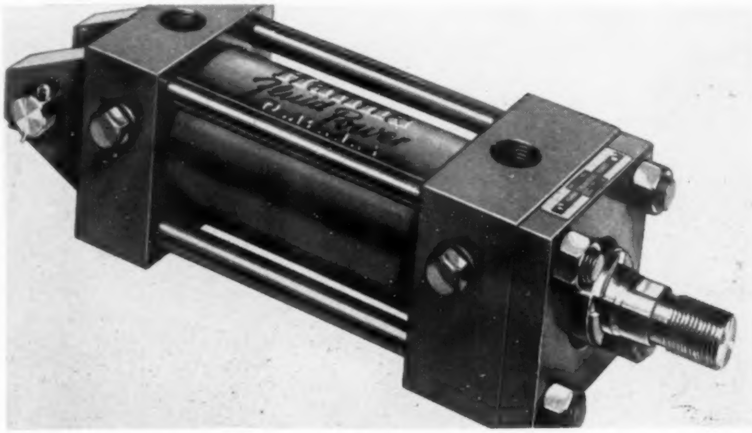
New Denison pilot-operated solenoid-controlled 4-way valve is shorter than conventional valves, yet is interchangeable with present valves.

Heavy-duty cylinders for automation applications are also manufactured by Ortman-Miller Machine Co., Inc.

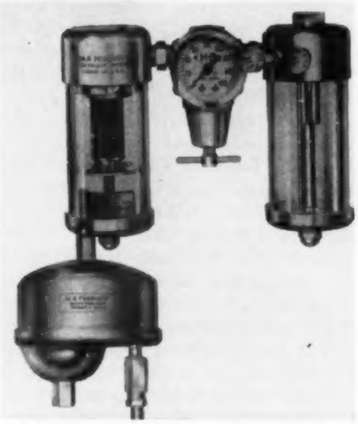
Cylinder performance in service is dependent on the effectiveness of the



Typical assembly of Asco solenoid valves mounted on a manifold body.



Hanna hydraulic cylinders are provided in thirteen mounting styles so that cylinders for almost any application are available from catalog.



M-B Products, Inc. W-1 Whirl-a-way filter, regulator and lubricator. Trap at the bottom of the filter receives four ounces of water from the filter, then discharges it automatically.

C. B. Hunt & Son, Inc. valve has simplified internal contruction.

Valvair ¼-inch plug-in type Speed King control valve has built-in plugs and connectors for quick installation.

seals used. The Miller Fluid Power Div. of Flick-Reedy Corp. has developed two lines of Teflon-sealed hydraulic cylinders. A new tubing end seal and the use of Teflon have enabled the pressure ratings of all Miller high-pressure cylinders to be raised.

The seal is a combination of Teflon strip and a confining metal shoulder which restricts expansion of the tubing and prevents extrusion, due to its zero-clearance axial metal backup. It can withstand operational temperatures from −100 to 500 F and is impervious to all hydraulic fluids, including fire-resistant types.

Redesign of the piston rod bushing to eliminate O-ring construction and permit the use of a Teflon seal has removed the need for blind assembly, which sometimes causes shearing. Cushion adjustment is simplified by the use of a screw with a self-regulating Teflon lock seal which retains its seal no matter where the screw is set.

Thirteen basic mounting styles are available in the Powrdraulic cylinder line designed by Hanna Engineering Works. These cylinders are rated at 2000 psi shock and 3000 psi nonshock hydraulic pressures with a high safety factor. There is a choice of red sizes for each bore. Because of the number of mounting sizes available, a standard cylinder can be provided for practically every cylinder application.

New valve lines developed by Hanna include the Flo-Set 1000, a hydraulic speed control valve for operation at 1000 psi; Flo-Pilot 2 and 3-way pilot air valves; and Flo-Line 3 and 4-way solenoid and master air valves.

Pumps: When hydraulic systems are designed to operate at high working pressures, it is possible to use lower-weight components, resulting in lower cost per horsepower and smaller, more easily installed pumps, motors and valves. A new series of balanced-vane hydraulic pumps has been introduced by the Denison Engineering Div., American Brake Shoe Co. These pumps are designed for continuous service at a pressure of 2000 psi. Rated deliveries are up to 100 gpm at speeds up to 1800 rpm.

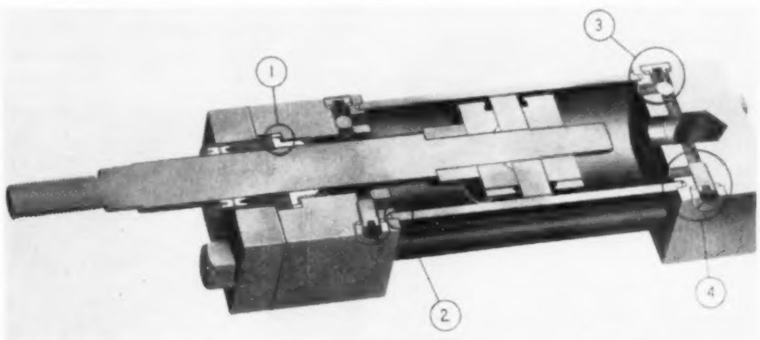
Hydraulically balanced vanes and rotors reduce wear on cam rings and thrust plates to give long pump life with minimum maintenance. The pumps operate in either clockwise or counter-clockwise directions.

Fluid transfers: While fluid transfers are not, strictly speaking, components of hydraulic power systems, many of the principles of design used for hydraulic components are also employed in fluid transfer design. The purpose of fluid transfers is to allow the passage of fluid, under high pressure, from a stationary member to a rotary member. Several basic types of fluid transfers are manufactured by the Sealol Corp.

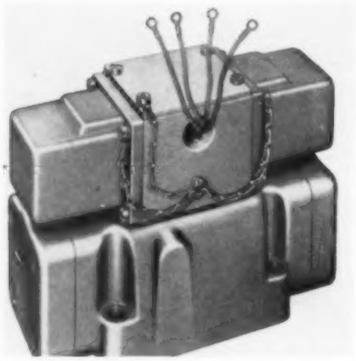
Type EL transfer is a medium-pressure, high-speed unit for use in conjunction with hollow shafts or spindles. The attachment is made at the shaft end for transfer of oil to actuate clutches or power cylinders, or to deliver coolant for drilling. A type EH transfer is similar to the EL unit except that it is designed for higher pressures. It incorporates two mechanical seals for the purpose of balancing axial thrust, thereby permitting high-speed and high-pressure operation.

A Sealol type DH drill adapter is intended for gun or oil hole drilling. These units can be furnished with either a flange or taper shank. There is also a type EA transfer unit that transfers air or air mists to operate clutches and cylinders.

Lubricators and Filters: Chucks, cylinders, tools and other air equipment can be lubricated by means of oil vapors or mists carried in the air line. The lubricators made by the Industrial Div., Watts Regulator Co., have an external adjustment screw for accurate control of oil feed rate from a few drops per minute to a steady flow. The entire area of the metered oil is exposed to a high-velocity air jet, providing uniform



Miller hydraulic clyinder has Teflon plastic seals (1 and 2), a redesigned ball check (3) and a new type of cushion adjusting screw (4).



Logan 3000-lb hydraulic valves designed for heavy-duty automation applications.

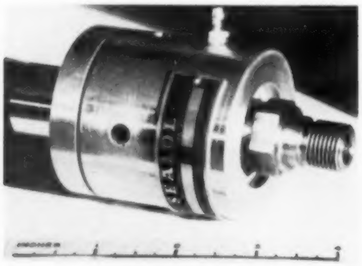
vaporization of the oil into the air.

Another important accessory for pneumatic power systems is an air filter. Watts Regulator Co. air filters are designed to remove both condensation and foreign matter such as pipe scale and rust from air flowing to pneumatic equipment. The filter has a contoured inlet that directs the incoming air in a downward helical pattern. This rotary action wrings the air dry of condensation and hurls larger impurities to an outer shell. The impurities then spiral downward to a quiet zone under a baffle.

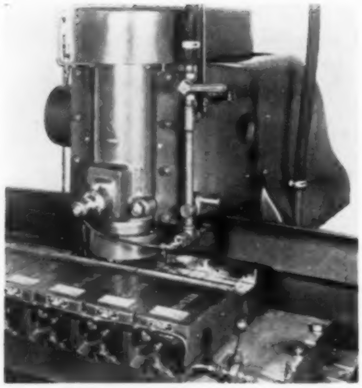
Clean dry air leaves the filter after passing through a porous bronze filter cone that removes particles down to 40 microns in size. Watts also makes several types of air pressure regulators.

Toolholders

Much thought has gone into the development of toolholders with quick-change and other features intended to improve operator convenience and maintenance and minimize tool change time. Sandvik Steel, Inc., for instance, has designed a Coromat T-Max throwaway type toolholder with three-position spring-lifted chipbreaker. It is not necessary to remove the chipbreaker to change cutting edges or depth of cut. Inserts are accurately seated in a precision-machined recess. Since the holder has no protruding parts, two or more holders can be clamped together for making multiple cuts.



Sealol fluid transfer unit for gun drill, clutch, power cylinder and similar applications. Fluid pressures of 1000 psi operate the unit at 8000 rpm.

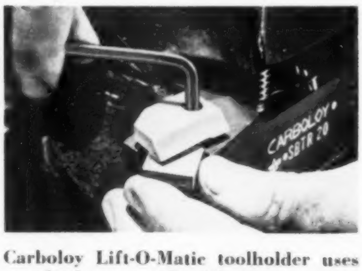


Six Airlox pneumatic vises mounted on a milling machine for bar milling. Each vise grips the work at 90 times air pressure. With a 100-lb line pressure, a total force of 54,000 lb is delivered on the workpiece.

Carboloy Lift-O-Matic toolholders have been improved to provide faster, more automatic indexing. The adjustment screw is accessible from either the top or bottom of the holder. A one-piece chipbreaker clamp raises and lowers with a twist of the adjustment screw. Chipbreakers are carbide-faced to resist wear and give better chip control.

The Adamas Dex-A-Tool clamp also has a carbide facing which acts as the chipbreaker or curler. This clamp has buttress type serrations on the bottom which mesh with serrations on the top of the tool shank. The serrations, plus an elongated slot, permit adjustment of chipbreaker width in increments of 0.030 inch.

A socket setscrew located at the rear of the clamp is adjustable against the clamp locking screw. This feature permits more rapid and positive relocation of the clamp after indexing the tip. A number of different tool geometries are available in Adamas standard designs.



Carboloy Lift-O-Matic toolholder uses standard cemented-oxide inserts.

A new development in toolholders—a throwaway insert type toolholder with variable geometry—has been introduced by United Tool Co. This Hudson Varirake allows changing of rake and relief angles without removal of the toolholder from the machine.

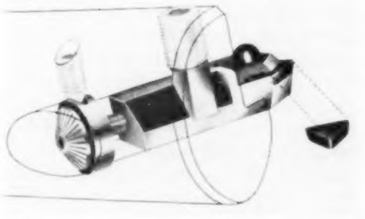
There is an indexable tapered support plate under the indexable cutting tip. A triangular support plate is used with a triangular throwaway. The top surface of the support plate is out of parallel with the bottom surface, the height of the plate varying at each of the three corners. Since the throwaway tip has parallel top and bottom surfaces, indexing the support plate varies the top rake of the tool. Each of two different support plates offer a choice of three top rake angles.

These toolholders are available in two shank sizes—$1\frac{1}{4}$ x 1 inch and $\frac{3}{4}$ x $\frac{1}{2}$ inch—and three styles: 15-deg lead or side cutting edge angle, zero side cutting edge angle for turning to square shoulders, and zero end cutting edge angle for facing to square shoulders. Each of these styles is available in right or left-hand design.

An optional feature of the new toolholder is the incorporation of a through-hole leading directly under the carbide blank for piping mist coolant. This allows coolant to penetrate under the chip, thus reducing the interface temperature through the gundrill.

Chucks: Quick-change features characterize the design of most chucks and toolholders for jig borers, transfer machine heads, milling machines and turret lathes. A new line of Quick Change toolholders and adapters has been designed by Erickson Tool Co. Scully-

Kwiklok quick-change toolholders and adapters make it possible to change tools in 3 seconds. They are made for boring mills, turret lathes, radials and multiple-spindle automatics.



Valenite micro-adjusted boring unit utilizes throwaway carbide inserts.

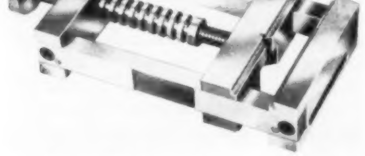
Jones quick-change chucks for end mills, drills, and similar tools, are designed to reduce down time for tool changes to seconds. They are intended for presetting outside the machine. An additional application is for automatic screw machine work.

The Jemco Drill-Tru (Jersey Mfg. Co.) is an attachment for small-hole turret drilling. It is available for Brown and Sharpe Nos. 00, 0 and 2 automatic screw machines using turrent driving attachments. Precision collets, instead of bushings, hold the drills, reducing setup time to a minimum and eliminating the need for special bushings. A readily accessible drill stop screw makes possible fast and accurate drill length adjustments.

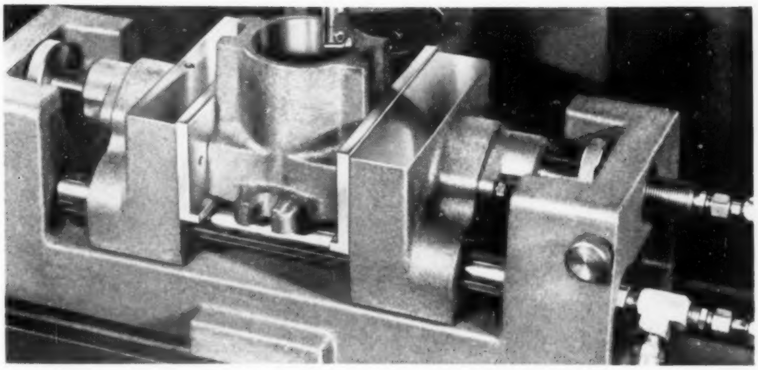
Standard cutting tools such as drills, reamers and end mills, also small special tools with the usual notched shank, need no preparation for use in Wej-Lok holders developed by Detroit Reamer & Tool Co. Tools are locked in place after insertion by turning the holder retaining ring. No wrenches, screwdrivers or other tools are required for locking cutting tools in these holders.

A keyless chuck for close tolerance drilling and jig boring has been introduced by Jacobs Mfg. Co. This Albrecht heavy-duty chuck is hand-locking and self-tightening.

Tapping Attachments: Elimination of tap breakage has always been a problem and several manufacturers have developed tapping attachments to overcome breakage. Wickman tapping attachments (the Wickman Mfg. Co.) are designed to provide sufficient torque for tapping and, at the same time, leave enough "give" to allow internal friction discs to slip when the tap hits



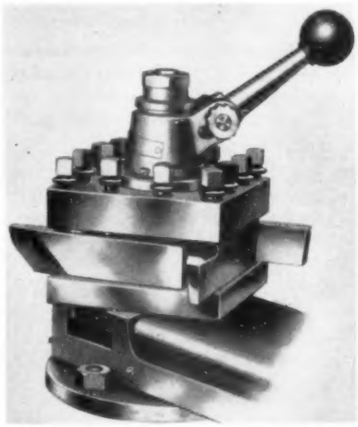
Producto Machine Co. toolroom vise with stepjaw design.



Seven inch air-hydraulic self-centering vise made by Heinrich Tools, Inc.

bottom in a blind hole or a hard spot in the workpiece material. The attachment can be used with any reversible spindle for horizontal or vertical tapping. It is designed to fit into a quick-change chuck which is a standard part of the attachment.

A new reversible Safe-Torque tap



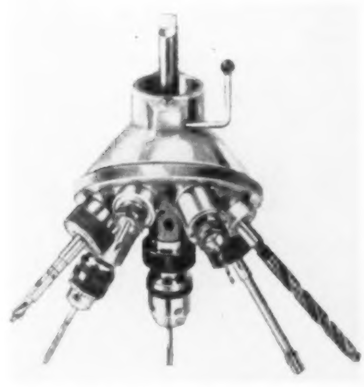
McCrosky turret tool post has clamping type handle.

driver developed by Scully-Jones has an overload clutch that releases instantly when driving torque reaches a preset limit. The clutch has an overrunning roller drive. A gear type reversing mechanism requires no adjustment and removes the tap without reversing the machine spindle. Scully-Jones also has designed a Safe-Torque hand screwdrive intended for precision assembly and maintenance work where power tools cannot be used. The torque setting, not the operator, determines the exact degree of tightness for each screw.

The Davis Tap-Saver tapping head adjusts to exactly the right force for each type of material and controls this force for the individual needs of drilling, reaming, counterboring, spot facing and tapping. It precisely varies torque for each size of tap, virtually eliminating breakage.

Multiple Drill Head: Any vertical single-spindle drill press can be converted to a multiple-spindle machine with the ARBO-2 head made by Jersey Mfg. Co. This is an automatic revolving and indexing multispindle drill head that takes two to seven tools at one time. All spindles are quickly and completely interchangeable. Ten independent speeds are available. The head makes it possible to complete machine workpieces with one chucking. No reversing of spindles is necessary during tapping operations. Tapping capacity is 1/8 to 9/16 inch; drilling capacity is up to 19/32 inch.

Tool Post: The McCrosky turret tool post with clamping type handle en-



Jersey Mfg. Co.'s indexing type multiple-spindle drill head is used with vertical single-spindle drill press.

ables the turret to withstand vibration and remain tightly locked, even when handling interrupted or heavy cuts, at the fast feeds and speeds used by modern production lathes. Operation of the turret is simple. Raising the handle from an approximately horizontal position to a 45-deg. angle clamps a locking collar tightly around the center column of the turret, with a powerful cam action that locks the turret rigid-

ly. Hand pressure only is required.

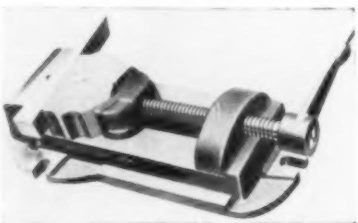
The turrent can be unlocked by lowering and pushing the handle slightly. This permits the turret to be rotated freely to any of 12 indexing positions. Because of the speed and accuracy of indexing, multiple jobs become continuous, enabling engine lathes to handle a variety of work that otherwise would require turret lathes or other specialized machines.

Workholding Devices

Means for holding workpieces are important supplements to toolmaking or production. Standard devices incorporating inherent flexibility can save untold amounts of money and time otherwise consumed in preparing special fixtures.

An improved locking device which assures positive foolproof locking, unlocking and relocking without sacrificing repetitive accuracy from one setup to another is a new feature of the Omer E. Robbins Magna-Sine magnetic sine plates. The plates have ribbed bases and intermediate plates for greater strength and rigidity. Another feature to save wear on both sine bar rolls and gage blocks which contribute to longer life of the equipment, is Robbins' Perma-Flat swivel block.

Vises: A turret vise made by Hudson Automatic Machine and Tool Co. is useful for clamping firmly and quickly pieces of any shape whether square, round, oval, conical, triangular or eccentric. The vise comes in various sizes for bench and machine use.



Hudson Automatic Machine and Tool turret vise for parts of almost any shape within the vise size range.

A toolroom vise for use on jig borers, surface grinders, drill presses and tappers is made by the Producto Machine Co. Of special interest is the stepjaw design, which eliminates the need for parallels, yet permits drilling of holes close to the workpiece. One jaw has a V-groove for holding punches, and is undercut for clearing the head of the punch.

A vise made by Malcus Tools Corp. has multiple jaws stacked on a round pin. The jaws swivel and produce various combinations of clamping faces.

Heinrich Tools Inc. has introduced a new seven-inch air-hydraulic centering vise. Each of two opposing jaws is actuated directly by a hydraulic cylinder on each side of the vise. The movement of the jaws is synchronized within a tolerance of 0.001 inch by a gear and rack under the body casting.

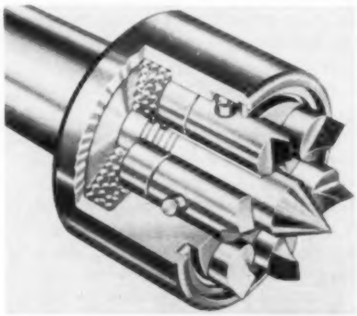
The seven-inch wide vise jaws have a maximum travel of 7/8 inch for each jaw, or 1 3/4 inch total. Holding power is operated by a foot treadle which keeps the operator's hands free.

Vises made by Illinois Metal Products

Illinois Metal Products Inc. hold-down vise has spring-loaded jaws to seat work accurately.

eliminate the use of parallels to raise the work. Spring loaded jaws seat the work accurately. Two sets of interchangeable jaws are furnished with the vise and are changed by removing a hinge pin.

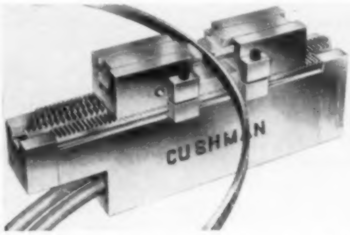
The 1/8 inch jaws, which are hardened, are for holding thin stock or for milling flanges on a block. The 15/32-inch jaws are soft enough to machine for special uses.



Drive center by Ideal Industries. Pressure of workpiece drives pins into chamber filled with steel balls. Compression of the balls locks the pins.

Chucks and Turning Aids: Originally designed as a component used in the Cushman Chuck Co. automatic pinch type chuck, automatic pinch jaws have a wide application for use on faceplates, milling machine tables or jig boring tables. Operated by air, each jaw adjusts itself automatically with the slightest resistance to the gripping surface of the workpiece. The pinch jaw is a self-locking device and once set, the workpiece is locked by the screw which operates the pinch unit.

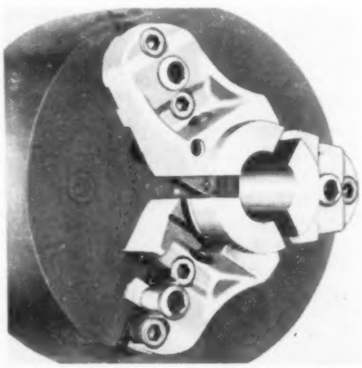
Ideal Industries offers a new machine



Cushman Chuck Co. automatic pinch type chuck adjusts itself automatically.

tool accessory for holding work between centers called the Ideal Driving Center. Operation of the center depends upon basic hydraulic and friction principles to grip one end of the work without the use of chucks, clamps or dogs.

A group of driving pins are pressed into a circular chamber of hardened steel balls when the center is in operation. As the driving pins are driven onto the workface, the balls act as a fluid, distributing pressure equally and locking the pins and the centering pin securely. Complete end-to-end machining can be done without removing the work from the machine and work can be loaded or unloaded without stopping the machine.



Chuck jaws made by Bedford Gear and Machine Products Inc. have replaceable section pads that can be shaped and hardened, then mounted on the machine.

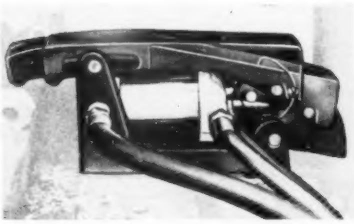
Grip-Tip Centers made by Detroit Reamer and Tool Co. have replaceable carbide tips. The tips are held in the holders by means of a clamp secured with two cap screws. The holders can be used indefinitely and the replaceable

tips can be stocked in adequate quantities to meet anticipated requirements.

A Stace 41A air chuck is a new design and permits either internal or external chucking. In order to reverse chucking direction, the Magic Air Cap, located on the large OD of the chuck is turned through 180 deg. Adding to the versatility is the wide variety of chuck jaws available from the manufacturer. A precision tooled registering ring is also provided for quick, precise installation of chuck jaws. Thus jaws may be removed and saved for future orders.

The chuck has a self-contained air chamber, thus eliminating the need for an external pressure chamber and draw bar arrangement. To provide the desired chucking pressure, the operator adjusts a regulator in the air line. The chuck will consistently provide this pressure until the regulator is readjusted. The chuck is distributed by Crodian and Co.

An individually adjustable chuck jaw, manufactured by Bedford Gear and Machine Products Inc. is made in two sections. One section has a built-



Air-operated automatic heavy-duty clamp designed by Lodding Inc.

in adjustment feature with 0.022 inch total movement. The second section is a detachable collet pad (soft or hard) similar to conventional pads ordinarily used in master collets.

Pads can be bored after being placed in position on the machine, or they can be shaped in the toolroom, hardened, and then mounted and adjusted at the machine. Pads machined for any production run can be detached from the master jaw and stored for later repeat runs.

Holding devices: The Unexko universal eccentric and coordinate head (Alina Corp.) enlarges the scope of machine tools. The head is a combination of an adjustable cross slide incorporating a spindle and an indexing device. The device allows simple and easy production of eccentrics and pieces of complicated shape, as well as accurate bores in coordinate distances.

Red Head toggle action clamps made by Case-Maul Mfg. Co. are useful for clamping work in drilling, welding,

Stace air chuck used for internal or external chucking. Reversal of the top cap changes the chucking direction without need of special tools.

milling, sawing, gluing, grinding, riveting, routing, machining or assembly operations. The red plastic handle is resistant to oil and acids and is noninflammable.

Lapeer Mfg. Co. supplies Knu-Vise air-operated clamps for automated systems. The clamps are double acting and will not release work should air or oil pressure fail. Five sizes are offered: 89, 200, 400, 800 and 1200 lb.

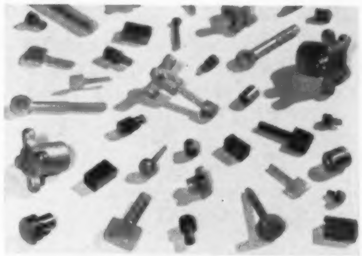
Lodding Inc. has placed on the market an air-operated automatic heavy-duty clamp. The clamp is cam-locked and will hold in the event of supply failure. Clamping pressure is ten times line pressure.

The model S Hydra-Lite hydraulic bar feed is designed to feed stock accurately, even at high spindle speeds found in late model single spindle screw machines. A swing stop accessory controls length of parts as accurately as a turret stop.

Jig and Fixture Components

One of the newest developments in jig and fixture design is the use of lightweight materials and plastics. Standard Parts Co. recently introduced a line of aluminum tumble box jigs which weigh less than half as much as equivalent steel jigs. Since the jigs are easy to handle, operator fatigue is reduced. Legs of the jig are cast iron and the top plate is steel. Because the legs project on all sides, head type bushings may be used on all sides of the jig. The jigs are available in 47 sizes, from 1 x 1 x 1 inch to 4 x 8 x 4 inches.

Nylon shoes for toggle shoe clamps made by Northwestern Tools, Inc. have been used in production for over two months without showing signs of wear. The plastic shoes eliminate scratching of workpieces. Since the shoes are resilient, it is not necessary to use a wrench for extra tightening. Standard-size and large shoes are available for all types and sizes of toggle shoe clamps. Northwestern also makes step block and



Jig and fixture details, fixture clamps, fixture keys and die pad retainers made by Harco Engineering.

clamp sets, T-nut and stud sets and other clamping tools.

Advance Products Corp. has developed a milling machine T-square that simplifies positioning of workpieces. The workpiece is placed against the wear strip of the T-square and clamped into position. Indicating is unnecessary. The T-square prevents the workpiece from shifting while under pressure from the cutter. Hardened-and-ground keys provide alignment with the table.

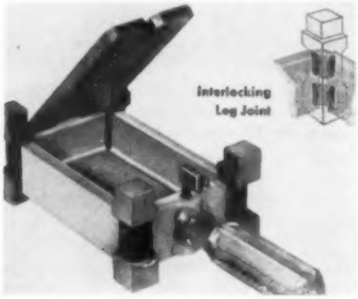
Alignment of thin stock in dies and fixtures is facilitated by the design of a new stock pusher made by Vlier Engineering, Inc. The device is compact and

Nylon shoes for toggle shoe clamps made by Northwestern Tools, Inc., eliminate marking of workpieces during clamping.

requires only one threaded hole for mounting.

Spring plungers are an effective means of providing controlled end pressure for tooling applications. Vlier Hex-

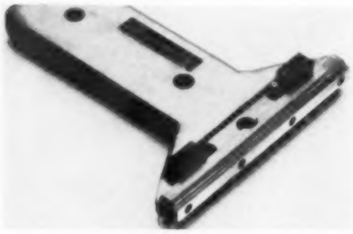
nose spring plungers can be installed or removed with an ordinary end wrench. Other Vlier plungers are a Standard model for jigs and fixtures; a Silvernose model to provide light repetitive end



Aluminum body lessens weight of Standard Parts Co. tumble jig.

pressure for die applications; and a Plasticnose model for use with aluminum, brass and similar soft materials.

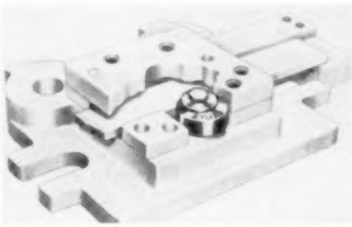
Drill jig bushing manufacturers have improved their products by using improved materials. Ace Drill Bushing Co., Inc., for instance, now furnishes bushings of a high-carbon chromium steel that doubles service life. Ace bushings are made in all sizes for all uses, including drilling steel, nonferrous metals, plastics and wood.



Milling machine T-square developed by Advance Products Corp. provides positive alignment of workpieces.

Portable Power Tools

Meeting competition and beating it requires the application of sharp thinking and utilization of the most efficient, but most economical methods of doing a given task. In operations requiring assembly or production usually done by hand, the application of portable power units can increase production and cut costs. An interesting solution to the problem of taping metal bars was solved by using a portable tape-winding machine manufactured by Universal Mfg. Co. This technique has been used in the electrical field but seldom seen in other manufacturing. The machine may be adjusted to various positions to determine the area being covered by the tape from the two take-off rolls. The tape is unwound from the spools which rotate around the stationary workpiece. In addition to the adhesive-backed tapes



Vlier stock pusher aids alignment of stock as thin as 0.010 inch and accommodates width variations up to 1/16 inch.

dispensed from the rolls, other materials such as cloth, paper and wire have been used.

Tightening and removing bolts, as well as nuts, screws, stud-setting and tapping are costly operations when done by hand. New reversible impact wrenches and nutsetters by Reed Roller Bit Co. are increasing production and reducing costs in plants where these operations had been a problem. In one heavy-equipment manufacturer, ten portable nutsetters have been combined in a counterbalanced jig plate to assemble main bearing caps more quickly. Torque regulation has been found so reliable that the manufacturer has removed the inspector from the operation and only makes spot inspections of the torqued main bearing cap bolts to be sure proper torque is being used. Other equipment manufactured by Reed is the Cleco pneumatic grinder which has the air exhaust noise reduced by a special built-in muffler.

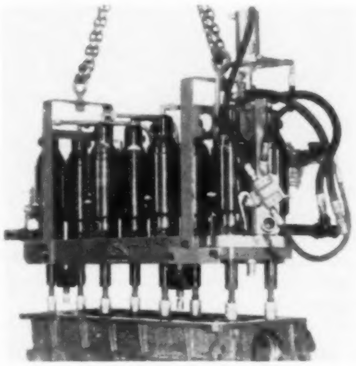
Drilling clean, true holes in hard metals such as titanium, heat-treated stainless or alloy steels is possible using the Keller Tool Div. K-matic positive feed drilling unit. This machine is a combination of an automatic precision drilling machine and a hand drill. Combining the best qualities of each, the unit has adjustable stops to prevent drilling in air and an automatic return at the end of the stroke. Design of the nosepiece makes it easily attachable or detachable from standard air or electric powered hand drills.

Keller Airfeedrills are excellent examples of the progress being made in the field of portable tools. Light in weight and small in diameter, they can be fitted into various mounting positions such as opposed, parallel, radial or skew. Fine feed rate adjustment of the air which drives the feed piston adds to the flexibility of the unit for a variety of production jobs. Keller has other types of portable air and electric power tools including screwdrivers, nutsetters, wrenches and air hoists as components of their line.

As a supplement to a portable drill, the Supreme push-pull tapper allows the operator to tap holes or pull out the tap without stopping the motor. The unit is a reversible speed reducer with gearing that permits instant reversal. It is adaptable to the tapping of holes in large castings where the workpiece is either too heavy, or complicated, or has holes at skewed angles, so that the workpiece could not be easily handled on automatic tapping machines.

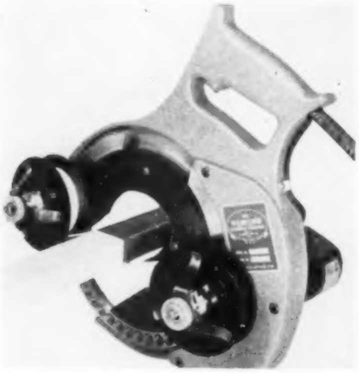
Grinding, using portable tools, is another method of reducing man-hours consumed in cleaning or finishing surfaces on castings or fabricated parts. Belt sanders by The Rotor Tool Co. are air-powered and have two handles for ease of handling. Features on the units include belt adjustments for tension and tracking, interchangeable air motors, and flexible belt guards to protect the operator without obstructing his view of the workpiece. For other applications where the belt sander will not work, Rotor Tool makes an air-powered small-wheel hand grinder.

Other interesting adaptations of portable tool principles have been applied to



The 8-spindle Cleco nutsetter for main bearing bolts, with an additional 2-spindle indexing unit for relocating over the rear bearing cap after the initial run-down for the eight bolts.

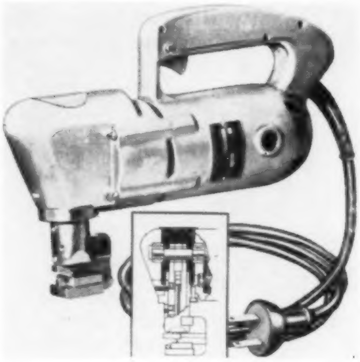
hammers and sheet-metal nibblers. The hammers, produced by Superior Pneumatic and Mfg., are air-powered and range in weight from 20 oz to 4 lb. A special metering trigger gives the operator complete control of the unit and



Universal Mfg. Co. tape-winding machine wrapping tape on a square workpiece.

allows him to feather, i.e., vary the number of blows per minute, on critical operations. Scaling, chiseling, peening, routing, cutting and chipping in the metal fabricating and welding industries are among the many operations that can be performed with these units.

The Fenway pneumatic nibbler, distributed by Easco Products, cuts through 10 gage stainless steel without distortion on either side of the metal. Edges of the material are ready for

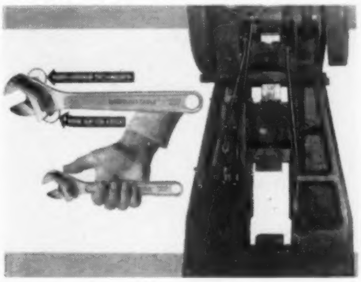


Fenway heavy-duty nibbler capable of cutting 10 gage stainless steel. The insert shows the operating mechanism.

fabrication as soon as the cutting is completed. Examples of the range of materials that can be cut by this versatile unit include corrugated metal, tubes, pipes, or sheet stock.

Hand Tools

Although emphasis has been placed on the development of complex machine tools during the past few years, the role of improved hand tools in industry should not be overlooked. Engineers at J. H. Williams & Co., for example, have developed locking adjustable wrenches of improved design. A flick of the thumb or finger locks or unlocks the



Williams locking adjustable wrenches can be locked or unlocked at any opening selected with a flick of a finger.

wrenches of any opening selected. Williams also makes steel, aluminum, brass, bronze titanium and monel drop forgings for custom applications.

The Teniplex inertial impact hammer of the Custanite Corp. offers several advantages over conventional plastic and soft-faced hammers. Machined plastic tips are screwed onto an all-metal one-piece head and handle. The plastic tips eliminate "bounce" and sparking, and they do not "mushroom."

Steel hand files are found in every plant. An improved all-purpose machinist's file developed by Nicholson File Co. gives fast stock removal and smooth finishing on aluminum, brass, bronze, malleable iron and annealed tool steels. A large variety of Swiss pattern files, milled curved-tooth files, and high-speed steel and carbide rotary power files is also manufactured by Nicholson.

Drafting Room Equipment

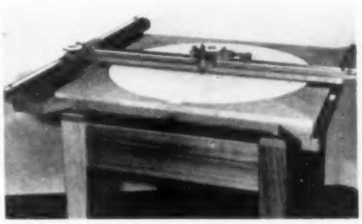
Any device that reduces design time is a welcome addition to the drafting room. Elimination of laborious drawing techniques and improvement of accuracy are vital to keeping pace with competition. The Aristo Coordinatographic drawing machine for making precision charts used in comparators and optical profile grinders offers accuracy and speed.

The machine, distributed by Eric R. Bachmann Co., Inc., features two precision slides fixed at right angles to each other. The instrument bushing is suited for pencil, pen or scribing tools. Magnifying glasses can be inserted into the bushing is desired, as well as a compass. A 30-inch diameter circular table, graduated in degrees, is standard. The top of the table is a distortion-free aluminum casting covered with opaque plastic sheet. The machine has two magnification scales: 25X and 50X. Any drafting material can be used: paper, plastic film or glass. The plotting accuracy over the area is ±0.002 inch.

A high-volume, high-speed whiteprint machine built by the Ozalid Div. of General Aniline and Film Corp. accommodates materials up to 54 inches in width. The machine prints and develops at speeds up to 100 fpm. The automatic developer feed is synchronized for all speeds. A stainless steel conveyor through the developer system assures proper processing of all types of materials including plastic coated films and standard papers.

A variety of fluorescent and incandescent lamps is available, including one with a built-in magnifier made by Dazor Mfg. Corp.

New drafting machines have many features which increase their usefulness and ease of operation. The Nestler

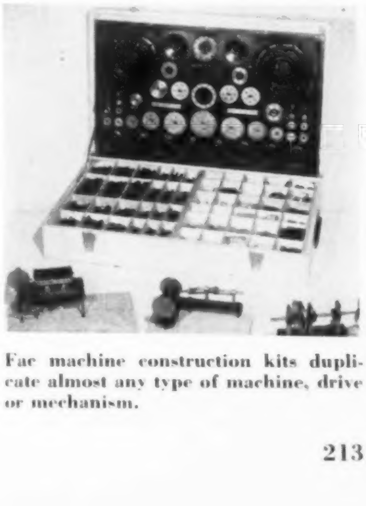


Aristo Coordinatographic Drafting Machine for drawing comparator charts on paper, plastic or glass.

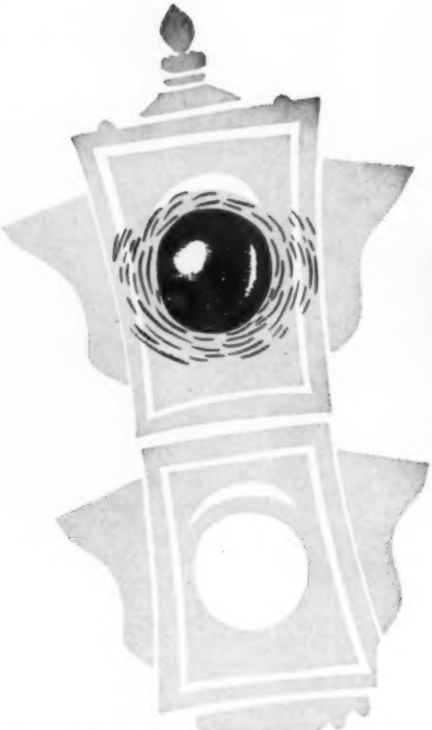
drafting machine, distributed by Ozalid, has a built-in cross-hatching device that can be used at any angle. The Isis machine, distributed by Allen J. Smith and Associates, has a ratchet motion control with a 10-min vernier.

Drawing tables can contribute to savings by reducing fatigue of the draftsman through new adjustment devices using power. The Mayline May-O-Line table has these features plus the added advantages of a smooth basswood top and all-steel construction.

Machine construction kits allow for construction of precision working models of practically any type of machine, drive or mechanism. Made by Fac, the kits enable engineers to examine their ideas in three dimensions and to eliminate design defects before production.



Fac machine construction kits duplicate almost any type of machine, drive or mechanism.




STOP

AT BOOTH 505

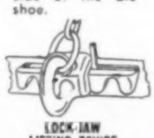
A.S.T.E. EXPOSITION

where courteous experienced Superior representatives will be on hand to demonstrate the exclusive time and money saving features of Superior Die Sets.

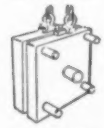
Illustrated at the left are just a few of many profit producing advantages you can enjoy in your die shop or stamping plant.

We'll be looking for you at the show!!!

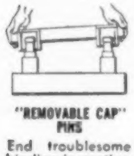
SAFETY FLANGE
protects fingers by providing roomy gripping space on either side of the die shoe.



LOCK-JAW LIFTING DEVICE
removes the danger of handling large die sets.



E-Z LIFT SLING CHAIN
attach to the lock-jaw for immediate lifting.



"REMOVABLE CAP" PINS
End troublesome binding in parting dies.

SUPERIOR STEEL PRODUCTS CORP.
2754 S. 19th ST., MILWAUKEE, WIS.

PLANTS AT MILWAUKEE, WISCONSIN
PLAINVILLE, CONNECTICUT

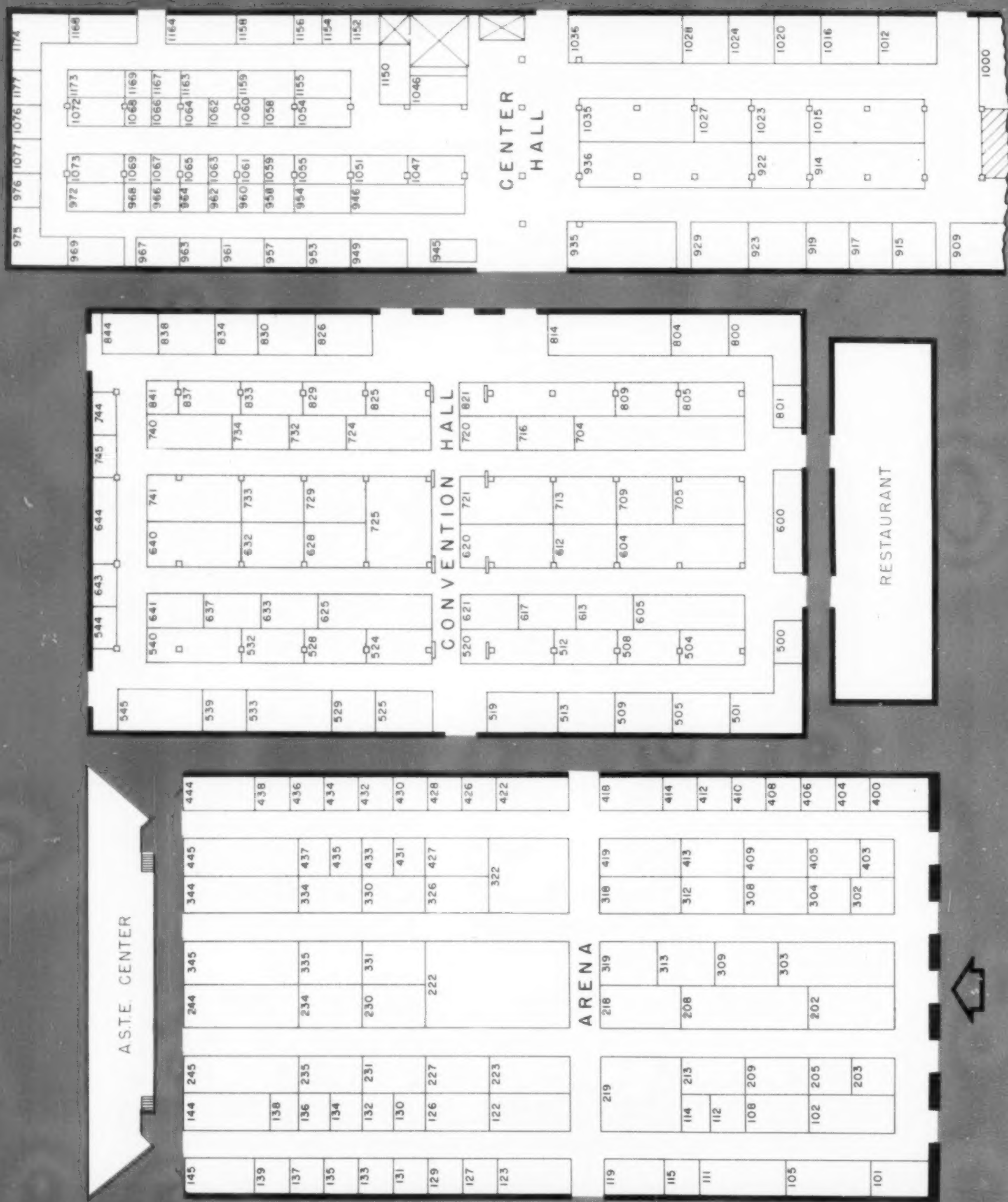
exhibitors

- Floor plan
- Booths
- Products

Floor Plan

CONVENTION CENTER — PHILADELPHIA

MAY 1-8, 1958




ARENA
CONVENTION HALL
CENTER HALL
GRAND HALL
SOUTH HALL
GRAND HALL
SOUTH HALL
ENTRANCE
TO PARKING LOT

EXHIBITORS AND PRODUCTS DISPLAYED

This list of exhibitors and product displays for the ASTE Tool Show is complete and accurate as of press time. We hope the listings will help visitors plan their show itineraries.

Booth No.

A A Gage Co. 532
350 Fair St. Ferndale 20, Mich.

Aaron Machinery Co., Inc. 1571
45 Crosby St. New York 12, N. Y.

Accurate Bushing Co. 1825
443 North Ave. Garwood, N. J.
Drill jig bushings, drilling fixtures, hardened and ground precision parts.

Ace Drill Corp. 432
2600 E. Maumee St. Adrian, Mich.
HSS twist drills, reamers; drill and reamer blanks; knockout and insert pins; carbide drills.

Ace Drill Bushing Co., Inc. 2052
5407 Fountain Ave.
Los Angeles 29, Calif.

Adamas Carbide Corp. 1600
Market St. Kenilworth, N. J.

Adcock & Shipley, Ltd. 1456
30 Church St. New York 7, N. Y.

Advance Products Corp. 2111
North Shore Dr. Benton Harbor, Mich.
Rotary tables and accessories, cold chambers for die casting machines, die casting services.

Aero Service Corp. 433
210 E. Courtland Philadelphia 20, Pa.
Coordinate plotter, counter dials, steel scale tapes, drafting boards, English and metric scales.

Airborne Instrument Laboratory 1918
310 Old Country Rd. Mineola, L. I., N. Y.
Electronic and mechanical gaging and control equipment, grinders, grinder controls.

Aircraft & Missiles Manufacturing 231
Chestnut & 56th St. Philadelphia 39, Pa.
Aircraft & Missiles Manufacturing magazine.

Booth No.

Airetool Mfg. Co. 1340
Center St. Springfield, Ohio
Pneumatic hand tools, including grinders, drills, screwdrivers, nut runners, tube cleaners and expanders.

AJB Co., The 133
1046 Wyndham Dr., Mounted Rte. 42
York, Pa.
Drafting machines, tables and accessories; posture chairs.

Alameda Gage Co. 409
10851 Capital Ave. Oak Park 37, Mich.

Alina Corp. 1774
122 E. Second St.
Mineola, L. I., N. Y.
Gaging and measuring instruments and equipment; optical dividing heads and rotary tables; scroll chucks; drill pointing machines; lathes; grinding, tapping, boring and milling machines.

Alkon Products Corp. 1154
200 Central Ave. Hawthorne, N. J.
Air and hydraulic cylinders; air, hydraulic, water and vacuum valves; pilot and solenoid valves; drill heads; automatic drill units; tapping drives; hydraulic pumps.

Almco Div., Queen Stove Works, Inc. 2101
505 Front St. Albert Lea, Minn.

Aloris Tool Co., Inc. 2045
419 Getty Ave. Clifton, N. J.

Alsop Engineering Corp. 1062
Milldale, Conn.
Filters, asbestos filter media.

'58

Booth No.

Alzmetall Machine Tool Factory 1456
Altenmarkt/ALZ
Upper Bavaria, Germany

American Cam Co. 1067
Hartford 1, Conn.

American Coldset Corp. 1860
U. S. Highway 46 Teterboro, N. J.

American Cystoscope Makers, Inc. 334
1241 Lafayette Ave.
New York 59, N. Y.

American Drill Bushing Co. 1749
5107 Pacific Blvd.
Los Angeles 58, Calif.
Drill jig bushings and drill bushings for plastic tooling.

American Edelstaal, Inc., Unimat Div. 1002
350 Broadway New York 13, N. Y.

American Herforder Corp. 1307
1801 W. Columbia Ave.
Chicago 26, Ill.

American Pullmax Co., Inc. 1722
2455 N. Sheffield Ave.
Chicago 14, Ill.
Universal shearing and forming machines.

American SIP Corp. 1734
100 E. 42nd St. New York 17, N. Y.
Jig boring and combination jig boring and milling machines, universal measuring machines and accessory equipment.

American Society of Tool Engineers, The Arena Stage
10700 Puritan Ave. Detroit 38, Mich.
Research, education, technical publication, THE TOOL ENGINEER, data sheet service and membership insurance; tickets and information.

American Standards Association 1910
70 E. 45th St. New York 17, N. Y.

Ames, B. C., Co. 227
131 Lexington St. Waltham 54, Mass.

Booth No.

AMF Tool Div. 1164
224 Glenwood Ave. Bloomfield, N. J.
Deburring cutters, drill press vises, automatic drill chucks, work positioners.

Amplex Div., Chrysler Corp. 1839
P. O. Box 2718 Detroit 31, Mich.

Anderson & Sons, Inc. 613
N. Elm St. Westfield, Mass.
Etched, lithographed, embossed, silk-screened and engraved plates, dials, etc.

Anderson Oil & Chemical Co., Inc. 331
P. O. Box 111 Portland, Conn.
Coolants, lubricants, cleaners, rust preventive and synthetic paints.

Annis, R. B., Co. 1077
1101 N. Delaware St.
Indianapolis 2, Ind.

Apex Tool & Cutter Co., Inc., The 509
235 Canal St. Shelton, Conn.

Armstrong Bros. Tool Co. 308
5200 W. Armstrong Ave.
Chicago 30, Ill.

Aro Equipment Corp., The 1810
Enterprise & Trevitt Sts. Bryan, Ohio
Automatic and portable air-operated drills, grinders, sanders, hand tools, screwdrivers, nutsetters and impact wrenches, air hoists and air motors.

Associated American Trading Div., Syrkus & Guttman 512
750 St. Ann's New York 56, N. Y.

Associated Technical Sales Co. 2134
1926 E. Siebenthaler Ave.
Dayton 4, Ohio

Ateliers Des Charmilles S. A. 1942
109 Route de Lyon
Geneva, Switzerland

Atlantic Machine Tool Works, Inc. 1914
549 Cedar St. Newington 11, Conn.
Jig borers.

Atlas Tack Corp. 539
Pleasant St. Fairhaven, Mass.
Eyelets, nails.

Austin Industrial Corp. 1471
76 Mamaroneck Ave.
White Plains, N. Y.
Horizontal and vertical milling machines; universal, vertical and horizontal shapers.

Auto Load, Inc. 335
23600 Telegraph Rd. Detroit 41, Mich.

Automatic Switch Co. 1838
Hanover Rd. Florham Park, N. J.
Standard and special 2, 3 and 4-way solenoid valves.

Automotive Industries 231
Chestnut & 56th St. Philadelphia 39, Pa.
Publication.

— B —

Bachmann, Eric R., Co. 704
27-11 Forty-First Ave.
Long Island City 1, N. Y.

Barber-Colman Co., Industrial Div. 1255
1300 Rock St. Rockford, Ill.
Cutters, hobs and reamers.

Booth No.

Barer Engineering & Machinery Co., Ltd. 1370
1252 Notre Dame St., W.
Montreal 3, Que.
Boring mills, radial drills, lathes, hydraulic press brakes, universal grinders.

Barker Engineering Co. 1258
500 S. Green Rd. Cleveland 21, Ohio

Barry Controls, Inc. 716
700 Pleasant St. Watertown 72, Mass.

Bausch & Lomb Optical Co. 119
635 St. Paul St. Rochester 2, N. Y.
Optical comparators, microscopes and macroscopes, Brinell microscopes, surface comparators and measuring magnifiers.

Beaver Tool & Engineering Corp. 829
500 W. County Rd. Gaylord, Mich.
Precision boring tools, quick-change tools, and accessories.

Bedford Gear & Machine Products 2008
20080 Frazier Dr.
Rocky River 16, Ohio

Bendix Aviation Corp., Research Laboratories Div. 936
P. O. Box 5115 Detroit 35, Mich.

Besly-Welles Corp. 632
118 Dearborn St. South Beloit, Ill.
Taps, gages, carbide cutting tools.

Bischoff Chemical Corp. 2148
Ivoryton, Conn.

Black Drill Co., Inc. 1051
1400 E. 222nd St. Cleveland 17, Ohio
Drills for hardened steel, cast alloy tool bits and precision castings.

Blackhawk Mfg. Co. 413
5325 W. Rogers St.
Milwaukee 46, Wis.

Black & Webster, Inc. 1457
445 Watertown St. Newton 58, Mass.
Electropunches, electrotables and special machines.

Blake, Edward Co., Inc. 1646
437 Cherry St.
West Newton 65, Mass.

Bliss, E. W., Co. 528
1375 Raff Rd., S. W. Canton, Ohio
Vises, rotary synchronizing switches, die makers supplies.

Boggis, Henry P., & Co. 1058
706 E. 163rd St. Cleveland 10, Ohio
Tap grinders.

Boice Gages, Inc. 234
Hyde Park, N. Y.

Bokum Tool Co., Inc. 414
14775 Wildemere Ave.
Detroit 38, Mich.

Boyar-Schultz Corp. 1539
2000 S. 25th Ave. Broadview, Ill.
Hydraulic and hand-feed grinding machines, accessories and attachments; profiling equipment; screw machines and attachments; tapping machines and attachment.

Branson Ultrasonic Corp. 745
37 Brown House Rd. Stamford, Conn.
Ultrasonic cleaning equipment and thickness gages.

Booth No.

Bridgeport Machines, Inc. 1705
500 Lindley St. Bridgeport 6, Conn.

Briney Mfg. Co. 203
1165 Seba Rd., P. O. Box 2208
Pontiac, Mich.
Adjustable boring heads or quills; bearings.

Bristol Co., The 1447
P. O. Box 1790 Waterbury 20, Conn.
Automatic feeder-driver for standard socket setscrews; cap screws, setscrews, pipe plugs, dowel pins, wrenches and keys.

British Industries Corp. 1238
80 Shore Rd. Port Washington 7, N.Y.

Brown & Sharpe Mfg. Co. 122
235 Promenade St. Providence 1, R. I.

Bruning, Charles, Co., Inc. 345
1800 W. Central Rd.
Mt. Prospect, Ill.

Bryant Gage & Spindle Div., Bryant Chucking Grinder Co. 123
P. O. Box 620 Springfield, Vt.
Internal and external thread comparators, bench and portable thread gages; bore, groove and O-ring gages; granite surface plates and stands; cylindrical setting rings.

Buck Mfg. Co. 2141
1355 N. 10th St. San Jose, Calif.

Buck Tool Co. 804
2015 Schippers Lane Kalamazoo, Mich.

Buckeye Tools Corp. 705
5005 Springboro Pike Dayton 9, Ohio

–C–

Carborundum Co., The 709
Latrobe, Pa.
Oxide cutting tools.

Carpenter Steel Co., The 725
101 W. Bern St. Reading, Pa.

Carr Lane Mfg. Co. 1066
9244 Shortridge Ave. St. Louis 22, Mo.
Fixture components.

Carter Controls Inc. 1244
2800 Bernice Rd. Lansing, Ill.

Case-Maul Mfg. Co. 1365
22 Harker St. Mansfield, Ohio

Cawi Machine Co. Inc. 972
34 Exchange Pl. Jersey City, N. J.
Drill grinding machine, web thinning machine, tool and cutter and saw blade grinding machines for circular metal saws, band saw and power hacksaw blades.

Cerro De Pasco Sales Corp. 1270
300 Park Ave. New York 22, N. Y.

Challenge Machinery Co., The 1073
19 N. First St. Grand Haven, Mich.
Surface plates and equipment, welding tables, work benches, floor plates, aluminum and magnesium checking equipment, magnesium tooling bridges and straightedges.

exhibitors list

	Booth No.
Champion Pneumatic Machinery Co. 825 N. Pleasant St. Princeton, Ill. Air compressors.	405
Charmilles Engineering Works Ltd. 109, route de Lyon Geneva, Switzerland Sparking machine tools.	1942
Chicago Pneumatic Tool Co. 6 E. 44th St. New York 17, N. Y.	1804
Chicago Tramrail Corp. 1330 S. Kostner Ave. Chicago 23, Ill.	1745
Cincinnati Milling & Grinding Machines, Inc., Meta-Dynamics Div. 4701 Marburg Ave. Cincinnati 9, Ohio Automatic high-frequency induction heating machine, flame hardening machines.	1555
Cincinnati Sub-Zero Products 3932 Reading Rd. Cincinnati 29, Ohio Low temperature equipment for production chilling and testing.	976
Circular Tool Co., Inc. 765 Allens Ave. Providence 5, R. I. HSS and carbide circular metal-cutting saws; HSS reamers and combination center drills.	326
Cities Service Petroleum, Inc. 54 Wall St. New York 5, N. Y.	108
Clark, Robert H., Co. 9330 Santa Monica Blvd. Beverly Hills, Calif.	1901
Cleco Div., Reed Roller Bit Co. 5125 Clinton Dr. Houston 20, Texas Portable pneumatic tools and accessories; sump pumps; multiple-spindle units, air-line fittings and accessories.	1871
Clementina, Ltd. 2277 Jerrold Ave. San Francisco 24, Calif.	1938
Cleveland Cutter & Reamer Co. Madison Ave. at W. 74th St. Cleveland 2, Ohio Special metal-cutting tools; HSS and carbide reamers, boring bars, circular and flat form tools, spotfacers, end mills, counterbores, arbors.	637
Cleveland Grinding Machine Sales Inc. 1643 Eddy Rd. Cleveland 12, Ohio	838
Cleveland Instrument Co. 735 Carnegie Ave. Cleveland 15, Ohio	953
Cogsdill Tool Products, Inc. 12980 W. Eight Mile Rd. Oak Park 37, Mich.	1243
Collins Microflat Co. 3249 W. El Segundo Blvd. Hawthorne, Calif. Surfaces plates, layout places, straight-edges, angle iron stands.	400

Booth No.

Colonial Mfg. Co., Inc. 1169
600 Berkshire Ave. Springfield, Mass.

Columbia International Corp. 1356
10-35 Forty-Fourth Dr. Long Island City 1, N. Y.

Commander Mfg. Co. 945
4225 W. Kinzie Chicago 24, Ill.

Connecticut Tool & Engineering 1860
Round Hill Rd. Fairfield, Conn.
Toolmaking machines.

Conover-Mast Publications, Inc. 600
205 E. 42nd St. New York 17, N. Y.
MILL & FACTORY magazines, PURCHASING magazine.

Cooper Weymouth, Inc. 1357
600 Honeyspot Rd. Stratford, Conn.

Covel Mfg. Co. 136
Graham Ave., P. O. Box 116 Benton Harbor, Mich.
Optical comparators.

Crafts, Arthur A., Co. 115
603 Newbury St. Boston 15, Mass.
Carbide and diamond gages, tools, and wear parts.

Crodian and Co. 1853
4897 Kessler Blvd., E. Dr. Indianapolis 20, Ind.
Air chucks, deburring tools, rotating air unions.

Crystal Lake Grinders 1453
Crystal Lake, Ill.
Universal cylindrical grinders.

Cushman Chuck Co., The 1439
806 Windsor Ave. Hartford 2, Conn.
Power and manually operated chucks, air cylinders, power wrenches, index chucks.

Custanite Corp. 2043
1228 Utica Ave. Brooklyn 3, N. Y.

Cycledynamics Inc. 1024
1715 Fisher Bldg. Detroit 2, Mich.

– D –

Dake Corp. 1744
724 Robbins Rd. Grand Haven, Mich.
Arbor presses; hand and air-operated hydraulic, electrohydraulic and die try-out presses.

Davis Boring Tool Div., Giddings & Lewis Machine Tool Co. 1517
142 Doty St. Fond du Lac, Wis.
Interchangeable block tooling, boring heads, boring tools, flycutter tools, stub boring tool sets, job tooling and accessories, drilling and tapping head, and planer and VBM tooling.

Davis, A. G., Gage & Engineering Co. 144
21435 Dequindre Hazel Park, Mich.
Flush-pin and dial indicator type gage components, gage blanks, depth, pin, bar and dial gages.

Dayton Perforators, Inc. 2106
1336 Stanley Ave. Dayton 4, Ohio

Dazor Mfg. Corp. 1675
4481-99 Duncan Ave. St. Louis 10, Mo.
Industrial lighting lamps and fixtures; magnifiers.

Booth No.

Denison Engineering Div., American Brake Shoe Co. 1012
1160 Dublin Rd. Columbus 16, Ohio

Detroit Reamer & Tool Co. 1054
780 W. Maple Rd., P. O. Box 174 Birmingham, Mich.

Detroit Stamping Co. 1353
350 Midland Ave. Detroit 3, Mich.
Manual and air-operated toggle clamps, steel and brass shim stock, arbor spacers and shims, blower housings and stampings.

Devcon Corp. 2004
Endicott St. Danvers, Mass.

DeVlieg Microbore Div. 1549
2720 W. Fourteen Mile Rd. Royal Oak, Mich.

DeWalt Div., American Machine & Foundry Co. 1572
Fountain Ave. Lancaster, Pa.
Radial arm wood and metal-cutting machinery.

Diamond Machine Tool Corp. 620
5111 Coffman-Pico Rd. Pico, Calif.

Dietzgen, Eugene, Co., Inc. 1735
218 E. 23rd St. New York 10, N. Y.
Drafting room tools, furniture and instruments; reproduction machines and papers; Perma Scale products; miniaturization systems.

DoAll Co., The 604
254 N. Laurel Ave. Des Plaines, Ill.

Doerr Electric Corp. 1335
510 N. Fourth Ave. Cedarburg, Wis.
Electric motors, gear motors, adjustable speed, drive and transmissions.

Dow Chemical Co., The, Magnesium Dept. 1653
Hopkins Bldg. Midland, Mich.
Magnesium tooling plate and magnesium jigs and fixtures.

Drillmation Co. 1371
6500 E. Eleven Mile Rd. Center Line, Mich.
Drilling and tapping units, building block components for boring, gun drilling, multiple drilling and tapping.

du Mont Corp., The 139
289 Wells Greenfield, Mass.
Standard broaches; magnetic and gage bases; tool bits; presses.

Durant Tool Supply Co. 2025
1-15 Thurbers Ave. Providence 5, R. I.
Power press attachments.

– E –

Eastern Machine & Tool Co. 431
170 Broadway New York 38, N. Y.

Eastman Kodak Co., Apparatus & Optical Div. 208
400 Plymouth Ave., N. Rochester, N. Y.
Optical gaging equipment, standard and special chart gages, standard and special contour projector tracers and fixtures, infrared detectors.

Eclipse Counterbore Co. 344
1600 Bonner Ave. Detroit 20, Mich.
HSS and carbide counterbores, countersinks, core drills, spotfacers and cutters; end mills.

Booth No.

Electro Arc Sales Co., Easco Products Div. 1805
P. O. Box 587 Ypsilanti, Mich.

Electro-Autosizing Machine Corp. 136
7 William St. Closter, N. J.
Inspection, computing and control equipment; gaging equipment; automatic feeds.

Electromark Corp., The 1156
2093 E. 19th St. Cleveland 15, Ohio
Electrochemical marking equipment and supplies.

Elox Corp. of Michigan 935
1830 N. Stevenson Hwy. Royal Oak 3, Mich.
Electrical discharge machine tool, power supply, die sinking equipment, grinding tools.

Enco Mfg. Co. 504
4520 W. Fullerton Chicago 39, Ill.

exhibitors list

Encyclopedia Britannica 966
42 S. Fifteenth St. Philadelphia 2, Pa.

Engelberg Huller Co., Inc. 1604
831 W. Fayette Syracuse 4, N. Y.

Engis Equipment Co. 218
431 S. Dearborn St. Chicago 5, Ill.

Equipto Div., Aurora Equipment Co. 975
401 Highland Aurora, Ill.

Erickson Tool Co. 805
Solon Rd. Solon, Ohio

Errington Mechanical Laboratory, Inc. 1076
24 Norwood Ave. Staten Island 4, N. Y.
Multiple drill and tapping heads, tappers, tap holders, quick-change holders.

Esbec Barrel Finishing Corp., The 954
18 Beech St. Byram, Conn.
Barrel finishing equipment, finishing compounds.

Everite Machine Products Co. 134
2005 E. Huntingdon St. Philadelphia 25, Pa.
Electrochemical machine tools for carbide tool grinding.

– F –

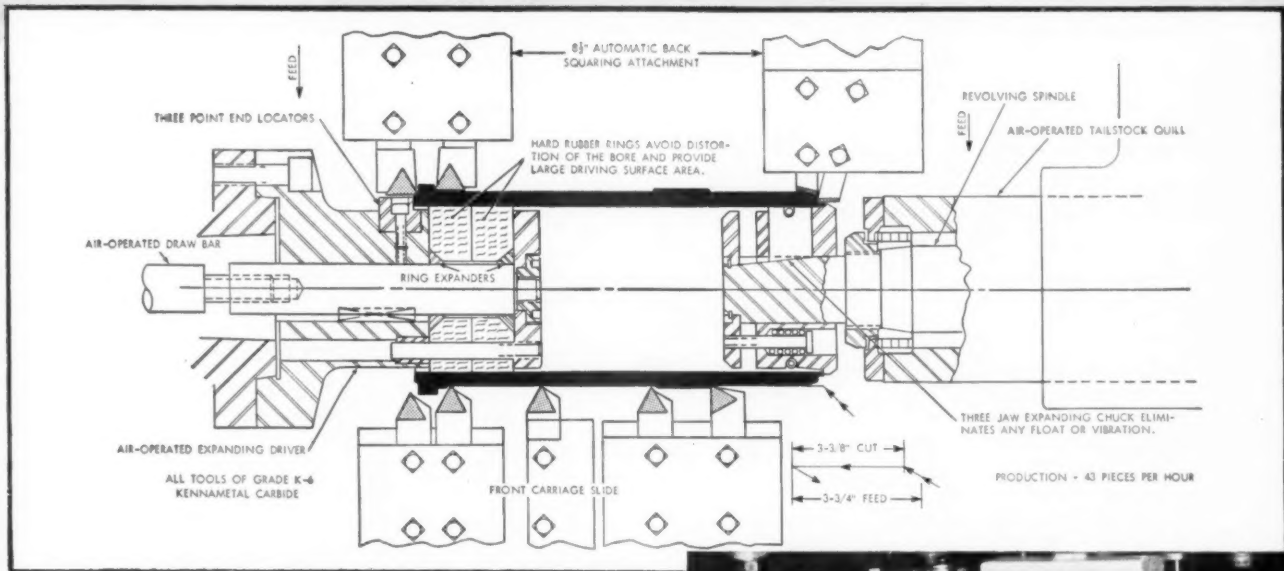
FAC Div. of Overseas Commodex Corp. 1700
No. 8 Bridge St. New York, N. Y.

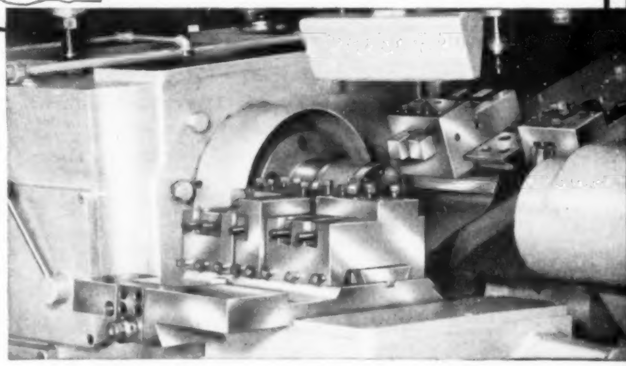
Falcon Tool Co. 213
P. O. Box 4605 Detroit 34, Mich.
HSS and carbide-tipped milling cutters, form relieved cutters, special tools, end mills and counterbores; quick-change toolholders and adapters; automatic chamfering tools. Bronze and steel wear strips and plates.

Fawick Airflex Div., Fawick Corp. 513
9919 Clinton Rd. Cleveland 11, Ohio
Air-operated and magnetic clutches and brakes; quick release valves.

Fellows Gear Shaper Co., The 1820
78 River St. Springfield, Vt.

CYLINDER LINERS MACHINED ECONOMICALLY ON Lo-swing LATHES



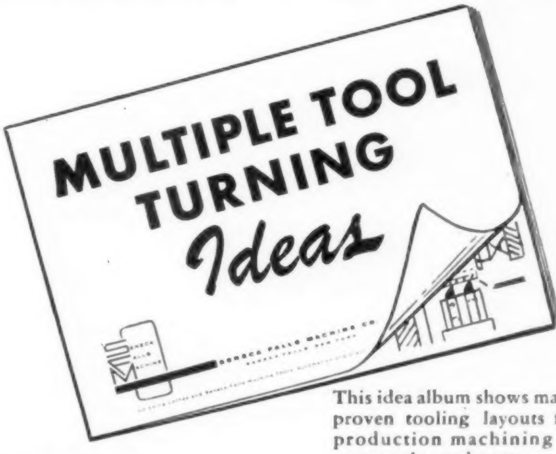


PROBLEM: To turn . . . without distortion . . . as well as face and chamfer, various cast, thin wall Diesel Cylinder Liners.

SOLUTION: The Model AR Automatic Lo-swing Lathe was selected for this job as it has: (1) *Necessary rigidity* for utilizing carbide tools. (2) *Simplified Change-Over Mechanism,* permitting all cams to be pre-set to graduated dials for length of cut. (3) *Instantaneous Tool Relief Control Mechanism,* which permits reversing carriage and slide feed movements without disturbing timing of slides or adjustment of the tools.

The Cylinder Liners are driven on the headstock end with a special driver which permits high cutting speeds and coarse carriage feeds without distortion. The tailstock end of the liner is supported with an expanding chuck operating under controlled air pressure to prevent distortion. All turning, facing and chamfering operations are performed simultaneously. The entire cycle is automatic; the operator simply loads and unloads the parts and pushes the starting button.

PRODUCTION!!! 43 pieces per hour at 100% efficiency. Seneca Falls engineers find solutions for the most difficult turning problems and are at your service.



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Booth No.

Fenlind Engineering Co. 625
5602 Pike Rd. Rockford (Loves Park), Ill.
Vertical milling machines.

Ferguson Machine Corp. of Indiana 605
7818 Maplewood Industrial Ct.
St. Louis 17, Mo.
Indexing tables and mechanisms, roll feeds, dial-fed presses, press dial feeds, integral motor-clutch brakes.

Fidelity Tool Supply 1761
309 Vine St. Camden 2, N. J.

Field, William H., Co., Inc. 962
323 Dorchester Ave. Boston 27, Mass.

Firth Sterling, Inc. 202
3113 Forbes St. Pittsburgh 30, Pa.

Fonda Gage Co., Inc. 2119
200 Henry St. Stamford, Conn.

Foster Supplies Co. 2001
6122 Milwaukee Ave. Chicago 30, Ill.
Bore and height gages and accessories, inspection gages and vernier calipers.

Furane Plastics, Inc. 1072
4516 Brazil St. Los Angeles 39, Calif.

–G–

Gaertner Scientific Corp., The 426
1100 W. Wrightwood Ave.
Chicago 14, Ill.
Microscopes and optical inspection equipment and attachments.

Gairing Tool Co., The 318
21221 Hoover Rd. Detroit 32, Mich.

Galland-Henning Mfg. Co. 834
2753 S. Thirty-First St.
Milwaukee 46, Wis.

Gammons-Hoaglund Co., The 500
395 Main St. Manchester, Conn.

Gardner-Denver Co. 1930
Quincy, Ill.

Gay-Lee Co. 1919
71 W. Fourteen Mile Rd.
Clawson, Mich.

General Electric Co. 1770
1 River Rd. Schenectady, N. Y.
Electronic and motor generator induction heaters, numerical positioning controls; adjustable speed drives; manual and magnetic motor starters; pushbuttons, relays, limit switches, solenoids and static controls.

George, James W., Machinery Co. 1456
519 E. Jefferson Ave. Detroit 26, Mich.
Universal grinding and jig boring machines, hydraulic cold sawing and saw sharpening machines, segmental saw blades, nibbling and universal sheet-metal working machines, electric hand shears and nibblers, upright and radial drilling machines.

Gilman, Russell T., Inc. 1016
624 Beech St. Grafton, Wis.
Dovetail machine slides, precision machine spindles, machine tables.

Giustina Corp. of America 2152
120 Wall St. New York 5, N. Y.

Govro-Nelson Co., The 2145
1931 Antoinette St. Detroit 8, Mich.
Automatic drilling and tapping units.

Booth No.

Graham Machine Tool Co. 1721
19 Cleveland Place New York 13, N. Y.
Surface and cylindrical grinders, turret lathes, jig boring, milling and band-sawing machines.

Graymills Corp. 1214
3705 N. Lincoln Ave. Chicago 13, Ill.

Green Instrument Co., Inc. 1065
385 Putnam Ave. Cambridge 39, Mass.
Pantograph engraving machines, rotary tables, compound slides, cutter grinders, production jigs and fixtures.

Greist Mfg. Co. 145
446 Blake St. New Haven 15, Conn.

* exhibitors list

Grob, Inc. 520
Grafton, Wis.

Grobet File Co. of America, Inc. 2121
750 Washington Ave. Carlstadt, N. J.
American, Swiss and rotary files; countersinks.

Gulf Oil Corp. 313
P. O. Box 1166 Pittsburgh 30, Pa.

Guthery Machine Tool Corp. 1204
38-31 Crescent St.
Long Island City 1, N. Y.
Automatic screw machines, Traub single-spindle chucking machines, magazine loading bar feeds.

–H–

Hamco Machines, Inc. 2146
99 Mt. Hope Ave. Rochester, N. Y.
Saw sharpeners for circular, hack, band and hole saws.

Hamilton Watch Co. 1925
Columbia Ave. Lancaster, Pa.
Hole gages; engineered parts and assemblies.

Hammond Machinery Builders, Inc. 1704
1600 Douglas Ave. Kalamazoo, Mich.
Electrolytic carbide tool grinders, belt finishers, dust collecting equipment.

Handy & Harman 244
82 Fulton St. New York 38, N. Y.
Silver brazing material and flux, aluminum brazing material, silver alloys.

Hanna Engineering Works 713
1765 Elston Ave. Chicago 22, Ill.
Air and hydraulic cylinders and control valves.

Hansford Mfg. Corp., Davis Keyseater Co., Div. 961
1239 University Ave. Rochester 7, N. Y.
Die handler, keyseaters.

Harco Engineering 428
12092 Woodbine Ave. Detroit 39, Mich.
Standard jig and fixture clamps and details.

Booth No.

Harig Mfg. Corp. 1027
5757 W. Howard St. Chicago 31, Ill.
Carbide dies, perforator grinding fixtures, surface grinder.

Harrison, T. S., & Sons, Ltd. 1456
Union St. Heckmondwike, Yorks, Eng.

Hause Machines, Inc. 1150
809 S. Pleasant Montpelier, Ohio

Heinrich Tools, Inc. 1252
2707 Industrial Dr. Racine, Wis.

Heller Tool Co. 1020
Heller Dr. Newcomerstown, Ohio
Files, rasps, carbide rotary burrs and tools, hack and band saw blades, die steel, low-carbon steel.

Herman Stone Co., The 2046
1860 N. Gettysburg Ave.
Dayton 27, Ohio
Granite surface plates and riser blocks.

Hevi Duty Electric Co. 205
Milwaukee 1, Wis.

Hillyer Instrument Co., Inc. 1701
331 Centennial Ave. Cranford, N. J.
Numerical controls, numerically controlled drilling machines, punched tape reading equipment.

Hitchcock Publishing Co. 410
222 E. Willow Ave. Wheaton, Ill.
MACHINE AND TOOL BLUE BOOK, MACHINE AND TOOL DIRECTORY, GRINDING AND FINISHING, CARBIDE ENGINEERING and MACHINE TOOL CYCLOPEDIA industrial training program.

Hofmann Engineering 2042
5601 S. Crawford Ave. Chicago 29, Ill.

Hoglund Engineering and Mfg. Co., Inc. 1301
343 Snyder Ave. Berkeley Heights, N. J.
Contour wheel dressers and special machinery.

Homestrand, Inc. 729
9 Addison St. Larchmont, N. Y.
Lathes, milling machines, boring machines, jig borers.

Hovis Screw Lock Co. 1064
8100 E. Nine Mile Rd. Warren, Mich.

Howe & Fant, Inc. 1662
20 Fitch St. E. Norwalk, Conn.
Turrett drilling and tapping machines, universal positioning tables, turret drilling attachment.

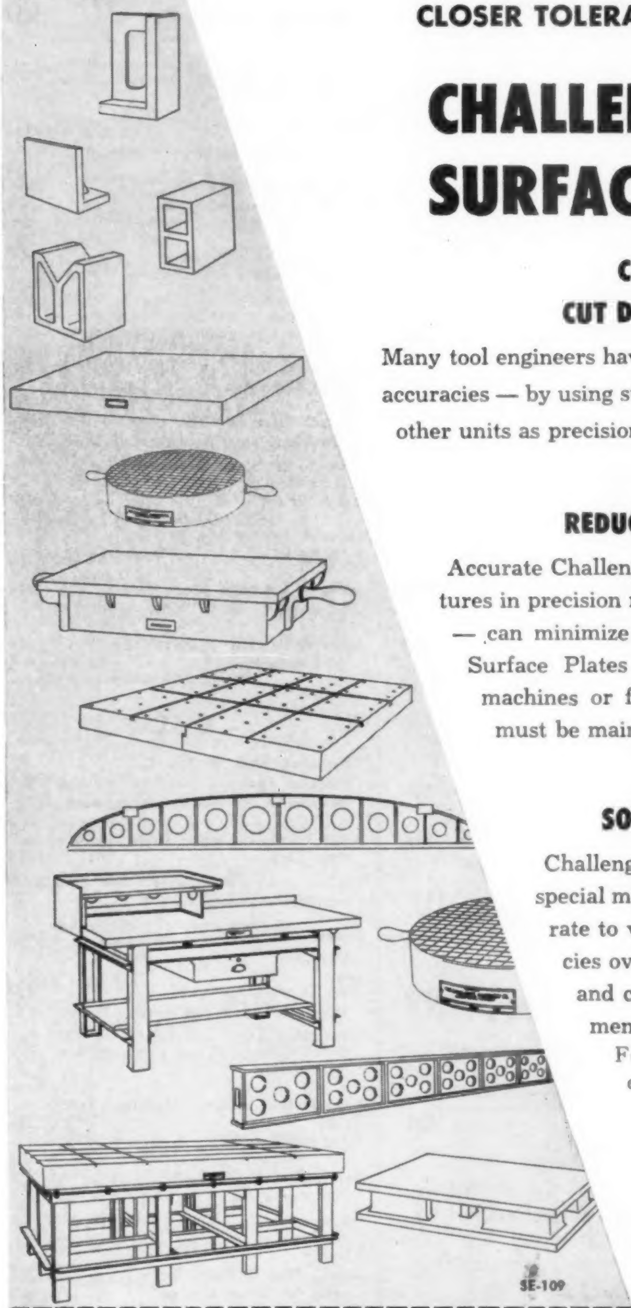
Hudson Automatic Machine & Tool Co. 1055
137-139 Thirty Eighth St.
Swiss type automatics, cam-making equipment, cutting and burnishing machines, filing machines, turret jaw vises, projecting microscopes, collets and carbide bushings for Swiss automatics.

Humphrey Products Div., General Gas Light Co. 1900
202 N. Park St. Kalamazoo 11, Mich.

Hunt, C. B., & Son, Inc. 529
1900 E. Pershing St. Salem, Ohio
Air and hydraulic control valves, solenoid air valves.

TOOL ENGINEERS:

FACED WITH A PROBLEM OF HOLDING CLOSER TOLERANCES IN YOUR OPERATIONS?



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ASTE SHOW BOOTH 1073

exhibitors list

Booth No.

Huron Machine Products Inc. — 127
6252 Monroe Blvd. Dearborn, Mich.
Gage supplies and accessories; chuck jaws; cutting compound.

— I —

Ideal Industries, Inc. — 1650
Park & Borden Aves. Sycamore, Ill.
Live and driving centers.

Illinois Institute of Technology — 1850
3418 N. Knox Ave. Chicago 41, Ill.

Illinois Metal Products — 1168
429 W. Superior St. Chicago 10, Ill.

Illinite Div. Illinois Tool Works — 826
2501 N. Keeler Ave. Chicago 39, Ill.

Index Machine Co. — 524
543 N. Mechanic St. Jackson, Mich.
Vertical and horizontal milling machines and attachments, milling heads, rotary tables, swivel base vises, drilling machines.

Industrial Diamond Association of America, Inc. — 1840
587A Newark-Pompton Turnpike
P. O. Box 175 Pompton Plains, N. J.
Rough diamonds, diamond dressing and truing tools, wire drawing dies, abrasive powders, compounds, scribers and engraving tools.

Industrial Press — 825
93 Worth St. New York 13, N. Y.

Industrial Tectonics, Inc. — 427
3686 Jackson Rd. Ann Arbor, Mich.
Balls, ballizing equipment, bearings.

Ingersoll Milling Machine Co., Cutter Div. — 621
707 Fulton Rockford, Ill.

Ingersoll Rand Co. — 1639
11 Broadway New York 4, N. Y.

International Research & Development Corp. — 209
P. O. Box 1707 Columbus 16, Ohio

Inter-Lakes Engineering — 801
39200 Groesbeck Hwy.
Mt. Clemens, Mich.

Iron Age, The — 231
Chestnut & 56th St. Philadelphia 39, Pa.
THE IRON AGE magazine.

— J —

J & S Tool Co., Inc. — 1501
87 Dorsa Ave. Livingston, N. J.

Jacobs Mfg. Co., The — 1535
West Hartford 10, Conn.

Jarvis Corp. — 1417
Pease Ave. & Stack St.
Middletown, Conn.

Booth No.

Jemco Tool Corp. — 1167
22 State St. Seneca Falls, N. Y.
Electric nibblers and hand shears.

Jeon Mfg. Co. — 2054
P. O. Box 6750 Washington 20, D. C.

Jergens Tool Specialty Co. — 1672
721 E. 163rd St. Cleveland 10, Ohio
Jig and fixture parts, spring plungers, sine fixture key, chuck jaw blanks, strap clamp assemblies.

Jersey Mfg. Co. — 2154
401 Livingston Elizabeth, N. J.

Jiffy Disintegrators, Inc. — 2014
1503 E. Eleven Mile Rd.
Royal Oak, Mich.

Johansson, C. E., Gage Co. — 418
10641 Haggerty Ave. Dearborn 1, Mich.
Gage blocks, interference microscope, mechanical comparators, automatic sizing gage and control, precision gages.

Johansson, I. O., Co., The — 1946
7730 Austin Ave. Skokie, Ill.

Johnson Gage Co., The — 304
534 Cottage Grove Rd. Bloomfield, Conn.
Thread gages and comparators and accessories, turbine blade serration gages and analyzers.

Jones & Lamson Machine Co. — 1504
Clinton St. Springfield, Vt.

Jones & Laughlin Steel Corp. — 1716
3 Gateway Center Pittsburgh 30, Pa.

Jones & Shipman (Canada) Ltd. — 914
130 Elmslie St.,
Ville La Salle, Quebec, Can.

— K — L —

Kalamazoo Tank & Silo Co., Machine Tool Div. — 525
500 Harrison Kalamazoo, Mich.

Karge-Turnomat Div., Taber Instrument Corp. — 1915
North Tonawanda, N. Y.
Lathes and accessories.

Kennametal, Inc. — 1605
Lloyd Ave. Latrobe, Pa.

King Tester Corp. — 437
440-44 N. 13th St. Philadelphia 23, Pa.
Portable Brinell hardness testers, Brinell microscopes, and special testers and adapters.

Klingelhofer, Albert, Machine Tool Corp. — 1739
740 Colfax Ave. Kenilworth, N. J.

Koppy Tool & Die Co. — 915
1530 Farrow Ave. Ferndale 20, Mich.
Progressive die strips and tube piercing machines.

Lamina Dies & Tools, Inc. — 929
14925 W. Eleven Mile Rd.
Oak Park, Mich.
Guide pins, guide pin bushings, wear plates.

Landis Machine Co. — 1538
Church & Fifth Sts. Waynesboro, Pa.
Thread rolling heads and attachments, thread cutting die heads, collapsible taps, die head and tap chasers, thread rolls.

	Booth No.
Lapeer Mfg. Co. 3056 Davison Rd. Lapeer, Mich. Manually and air-operated clamps, pliers and wrenches.	833
Lassy Tool Co. 96 Bohemia St. Plainville, Conn.	1159
Latrobe Steel Co. Latrobe, Pa.	245
LeCount Tool Works 38 Cody St. West Hartford 10, Conn. Expanding mandrels.	2002
Lehmann-Fulton Boring Tool Co., Div. of Fulton Iron Works 4235 Duncan Ave. St. Louis 10, Mo. Taper lock screws; repair parts for blocks and boring bars; HSS, cast alloy and carbide tipped block cutting blades; interchangeable block cutters; adjustable and solid blocks.	137
Leland-Gifford Co. 1001 Southbridge St. Worcester 1, Mass. Drill jig bushings, hardened and ground parts.	2105
Link Aviation, Inc. Hillcrest Binghamton, N. Y.	444
Littleford Bros., Inc. 443-457 E. Pearl St. Cincinnati 2, Ohio	2120
Livernois Engineering Co. 25200 Trowbridge Dearborn, Mich. Transfer units, dies, automation accessories for dies and presses.	923
Lodding, Inc. 79 Beacon St. Worcester 1, Mass.	112
Logan Engineering Co. 4901 W. Lawrence Ave. Chicago 30, Ill. Automated turret lathe, screw cutting lathes, metal-cutting shapers.	625
Logansport Machine Co., Inc. Logansport, Ind. Air and hydraulic cylinders and valves, chucks, pumps.	1652
Lovejoy Tool Co., Inc. Springfield, Vt. High angle and throwaway indexable blade milling cutters; HSS and carbide mills, flywheels, arbors, adapters; carbide end mills.	1870
Lufkin Rule Co., The 1730 Hess St. Saginaw, Mich. Indicators, precision tools, magnetic base tools, wood and steel rules, and steel and woven tapes.	1046

—M—

M-B Products Inc. 46 Victor Ave. Detroit 3, Mich. Airline filters, lubricators, regulators and traps; portable pneumatic grinders.	1459
Mac-it Screw Div., Strong, Carlisle & Hammond 1392-94 W. Third St. Cleveland 13, Ohio Alloy steel fasteners.	404
Machine Tool Mfrs. Affiliates, Inc. 7801 Brookpark Rd. Cleveland 29, Ohio	1311

Booth No.

Madison-Faessler Co. 1224
Moberly, Mo.
Roller-burnishing tools and attachments, roller swaging tools, tube expanders and tube rolling equipment.

Madison Industries, Inc. 1224
687 W. Clay Muskegon, Mich.

Madison-Relco Tool Co. 1224
Providence, R. I.

Magnaflux Corp. 102
7300 W. Lawrence Ave. Chicago 31, Ill.

Malcus Tools Corp. 2047
1270 Broadway New York 1, N. Y.

Man-Au-Cycle Corp. of America 1748
132 Fifty-Third St. Brooklyn 32, N. Y.

Manex Machinery Corp. 733
204 Central Pk. S. New York 19, N. Y.

Marblette Corp., The 1950
37-31 Thirtieth St.
Long Island City 1, N. Y.
Epoxy and phenolic resin dies and tools.

Martin Engineering Co. 1361
U. S. Route 34 Neponset, Ill.
Ball actuated silent type, pneumatic and electric vibration inducers.

Maserati Corp. of America 1320
46 Sea Cliff Ave. Glen Cove, N. Y.

Master Chemical Corp. 1329
13 N. Huron St. Toledo 1, Ohio

Master Mfg. Co. 1316
1300 E. Ave. A Hutchinson, Kan.

Master Pneumatic Tool Co., Inc. 1271
Krick Rd. Bedford, Ohio
Portable air tools and air hoists.

Matthews, Jas. H., & Co. 1324
3942 Forbes St. Pittsburgh 12, Pa.
Printing and marking machines, stamping and embossing dies, press style holders and marking inks.

Mayline Co., Inc. 1234
619 N. Commerce St. Sheboygan, Wis.
Drafting room furniture and equipment.

McCaskey Industrial Div., Victor Adding Machine Co. 732
3900 N. Rockwell St. Chicago 18, Ill.
Job, gage, inspection and tool inventory control systems and supplies.

McCrosky Tool Corp. 1849
1341-1357 S. Main St. Meadville, Pa.
Inserted blade cutting tools; machine tool attachments.

McGraw-Hill Co. 105
330 W. 42nd St. New York 36, N. Y.

Mead Specialties Co., Inc. 1302
4114 N. Knox Ave. Chicago 41, Ill.
Air cylinders, valves; presses, vises, hammers, collet fixtures, feeders; abrasive belt machines.

Metal Carbides Corp. 740
6001 Southern Blvd. Youngstown 12, Ohio
Carbide cutting tools, blanks, draw dies; centerless blades, shear knives, work rolls; diamond wheels; cemented oxide toolholders and inserts.

Booth No.

Metal Removal Co., The 1305
1801 W. Columbia Ave. Chicago 26, Ill.

Metallurgical Products Dept., General Electric Co. 1435
11177 E. Eight Mile Rd.
Detroit 34, Mich.
Cemented carbides, toolholders for disposable inserts, brazed type tools, dies and woodworking knives; cemented oxide, disposable inserts and boring tool blanks; vacuum-melted alloys; man-made diamonds; high-density alloys, machinability computer.

Metalworking Publishing Co., Inc. 135
795 Boylston St. Boston 16, Mass.
METALWORKING magazine.

Metlab Co. 131
1000 E. Mermaid Lane
Philadelphia 18, Pa.

Mettler Machine Tool, Inc. 2142
155 Adeline St. New Haven 4, Conn.

Micro-Line Inc. 138
First National Bank Bldg.
Jamestown, N. Y.
Precision measuring scale, microscopes, optical viewing apparatus and reticules.

Micrometrical Mfg. Co. 223
345 S. Main St. Ann Arbor, Mich.
Measuring instruments for both laboratory and shop.

exhibitors list

Micro-Poise Engineering & Sales Co. 114
14851 Grand River Detroit 27, Mich.

Milford Rivet & Machine Co., The 1671
857 Bridgeport Ave. Milford, Conn.
Cold-headed rivets, standard and special automatic riveting machines.

Miller Fluid Power Co. 1625
2040 N. Hawthorne Ave.
Melrose Park, Ill.

Modern Devices 2108
Route 176 & Bradley Rd.
Libertyville, Ill.

Modern Machine Shop (Gardner Publications, Inc.) 633
431 Main St. Cincinnati 2, Ohio
Publications.

Modernair Corp. 1158
400 Preda St. San Leandro, Calif.
Air cylinders, control valves, hydraulic checking cylinder and collet holding fixture.

Mohawk Tools, Inc. 230
910 E. Main St. Montpelier, Ohio

Monroe Engineering Products, Inc. 132
1515 Hurd Rd. Monroe, Mich.

Moore Products Co. 1375
H & Lycoming Sts. Philadelphia 24, Pa.
Pneumatic comparator gages and gaging plugs, building-block-components for inspection and sorting systems; pressure regulators and thermometers.

Booth No.

Moore Special Tool Co., Inc. 1249
740 Union Ave. Bridgeport 7, Conn.
Measuring machine, motorized centers, indexing fixture, rotary tables and hole location accessories.

Morris, Robert E., Co., The 501
P. O. Box 41 West Hartford 7, Conn.
Handfed, semiautomatic and duplex milling machines, milling machine vises and accessories.

Morse, H. E., Co. 111
455 Douglas Ave. Holland, Mich.

Motch & Merryweather Machinery Co., The 720
1250 E. 222nd St.
Euclid (Cleveland) 17, Ohio
Segmental, solid and slitting saw blades; saw blades for soft metals; slitters; drivers and driving adapters.

— N —

National Acme Co. 2115
170 E. 131st St. Cleveland 8, Ohio

National Broach & Machine Co. 922
5600 St. Jean Ave. Detroit 13, Mich.
Gears and gear shaving, honing and inspection equipment; broaches and broaching fixtures.

Neise, Karl A. 1857
404 Fourth Ave. New York 16, N. Y.

Nelco Tool Co., Inc. 126
266 Center St. Manchester, Conn.

New-Hermes Engraving Machine Corp. 964
13-19 University Place
New York 3, N. Y.
Engraving equipment, accessories and attachments; cutter grinder and beveler.

New Plastic Corp. 844
1026 N. Sycamore Ave.
Los Angeles 38, Calif.
Hammers, mallets, sledges and drive punches; flexible oilers, replaceable and interchangeable tips.

New York Belting & Packing Co. 1824
1230 Avenue of the Americas
New York 20, N. Y.

Newage Industries 2104
222 Old York Rd. Jenkintown, Pa.

Nicholson File Co. 406
23 Acorn St. Providence 1, R. I.
Files and rasps, rotary power files; HSS and carbide burrs; soft-face hammers.

Nikon Inc. 1061
251 Fourth Ave. New York 10, N. Y.

Nilson, A. H., Machine Co., The 1817
Bridgeport Ave. Shelton, Conn.

Noble & Westbrook Mfg. Co., The 837
20 Westbrook St.
East Hartford 8, Conn.
Marking machines and equipment, steel stamps, marking and graduating dies, automatic and special numbering heads.

North American-Viking Drill Co. 2149
470 Kittson Ave. St. Paul 1, Minn.

Northwestern Tools, Inc. 968
117 Hollier Ave. Dayton 3, Ohio
Jig and fixture components, hold down and clamping tools.

	Booth No.
Nupla Mfg. Co. Div., New Plastic Corp. 1026 N. Sycamore Ave. Los Angeles 38, Calif.	844
Nylok Corp., The 611 Industrial Ave. Paramus, N. J. Depth setting gage for drilling, aircraft parts, aircraft type valves and fittings, automatic drilling and tapping units, drilling machines, fastening components.	643

—O—P—

O. K. Tool Co., Inc., The Elm St. Milford, N. H. Cutters and associated items.	1047
O-Vee Gauge Co. 3626 W. Slauson Los Angeles 43, Calif.	2005
Oakite Products, Inc. 19 Rector St. New York 6, N. Y.	641
Oberg Mfg. Co., Inc. Silverville Rd. Tarentum, Pa. Carbide stamping dies.	1771
Olivetti Corp. of America, Machine Tool Div. 42-33 Northern Blvd. Long Island City 1, N. Y. Milling, boring machines; drill presses; drill units.	1612
Olsen, Tinius, Testing Machine Co. Easton Rd. Willow Grove, Pa.	1023
O'Neil-Irwin Mfg. Co. 274 Eighth Ave. Lake City, Minn.	821
Optical Gaging Products, Inc. 26 Forbes St. Rochester 11, N. Y. Contour projector, chart layout material and machines, contour transcribers, optical projector staging fixtures, comparator chart-gages.	319
Opto-Metric Tools, Inc. 137 Varick St. New York 13, N. Y. Optical measuring instruments, including microscopes, gages, hardness testers and comparators; optical jig boring machines.	101
Orban, Kurt, Co., Inc. 34 Exchange Pl., Harborside Terminal Jersey City 2, N. J. Automatic gear hobbing, spinning, gear chamfering and deburring, and spline milling machines; copying lathes; tool and cutter grinders; automatic internal, face and cylindrical grinders; optical measuring system; jig borers; gear checking equipment; balancing equipment.	1205
Ortman-Miller Machine Co., Inc. 19-143rd St. Hammond, Ind. Air and hydraulic cylinders.	612
Osborn Mfg. Co., The 5401 Hamilton Ave. Cleveland 14, Ohio Power brushing machines, brushes and accessories.	1434
Ozalid Div., General Aniline & Film Corp. Ansco Rd. Johnson City, N. Y.	2129
PIC Design Corp., Sub. of Benrus Watch Co. 477 Atlantic Ave. East Rockaway, L. I., N. Y. Tool components, test fixture parts, precision instrument components.	1906

		Booth No.
Pacific Industrial Mfg. Co. 848 Forty-Ninth St. Oakland, Calif. Hydraulic press brakes.		1424
Patterson, Geo. C., Machine Co. 3409 Trumbull St. Cleveland 15, Ohio Flying shear type, high-speed, stationary and fine wire straightening and cutoff machines; universal and tilt type wire payoff reels.		1174
Pedrick Tool & Machine Co. 3640 N. Lawrence St. Philadelphia 40, Pa.		809
Pegard (Societe Anonyme Ateliers Marcel Pegard) Andenne, Belgium		1348
Penn Engineering & Mfg. Corp. P. O. Box 311 Doylestown, Pa. Fasteners, template drill jig bushings.		1924
Penton Publishing Co. 1213 W. Third St. Cleveland 13, Ohio Publications: STEEL, MACHINE DESIGN, AUTOMATION, FOUNDRY and NEW EQUIPMENT DIGEST, and technical books.		1616
Perry Equipment & Engineering Co. 3125 Brandes St. Erie, Pa.		1414
Petz-Emery Inc. Main St. Pleasant Valley, N. Y.		435
Pfauter Machine Co. 35 Lawrence St. Yonkers, N. Y.		1338
Pines Engineering Co., Inc. 601 Walnut St. Aurora, Ill. Bending machines.		1317
Pioneer Pump Div., Detroit Harvester Co. Paris, Ky. Coolant and lubricant pumps.		1657
Portage Double Quick, Inc. 1033 Sweitzer Ave. Akron 11, Ohio Quick-change tools, layout machines and table, carbide cutting tools, adjustable boring bars and bar cartridges, oscillating end mill driver, comparator gages.		1861
Porter Precision Products P. O. Box 208 Cincinnati 15, Ohio Piercing and form punches, die buttons, and sleeve supported and wire type perforators.		1821
Portman Instrument Co. Town Dock Rd. New Rochelle, N. Y.		434
Portomag Inc. 1511 E. Nine Mile Rd. Ferndale 20, Mich. Magnetic drill presses, magnetic angle and plate clamps.		919
Powermatic Machine Co. McMinneville, Tenn. Drill presses, metal-cutting band saws.		1943
Precise Products Corp. 3715 Blue River Rd. Racine, Wis. Power quills; grinding and milling machines; automatic drilling machines; HSS, tantung, carbide and diamond rotary tools, coolant equipment; hardness testers.		1155
Precision Detroit Co., Inc. 20100 Sherwood Ave. Detroit 34, Mich. Index tables, dial assembly presses, rivet spinners.		1248
Precision Tool & Mfg. Co. 1305 S. Laramie Ave. Cicero 50, Ill.		129

	Booth No.
Press Automation Systems, Inc. 25418 Ryan Rd. Center Line, Mich.	1256
Procunier Safety Chuck Co. 18 S. Clinton St. Chicago 6, Ill.	1725
Production Devices Inc. Davis St. Whitehall, N. Y. Air vises, power heads, pneumatic crimpers and air presses.	1363
Production Machine Co. 311 Wells St. Greenfield, Mass. Grinding, polishing and abrasive-belt machines.	1811
Producto Machine Co. 990 Housatonic Ave. Bridgeport 1, Conn.	1500
Punch Products Corp. 3800 Highland Ave. Niagara Falls, N. Y. Bolster plates, dies, die buttons, press brake rails, work gages and stops, T-slotted plates; piercing, perforating, tube notching and hole-punching units; template setups; unitized tooling.	1323

— R —

R and L Tools 1825 Bristol St. Philadelphia 40, Pa.	830
Rahn Granite Surface Plate Co. 641 N. Western Ave. Dayton 7, Ohio Black granite surface plates, angle plates, parallels and straightedges; instrument for calibrating plane surfaces.	403
Reichhold Chemicals, Inc. 525 N. Broadway White Plains, N. Y. Plastic tooling materials, including epoxy, polyester, phenolic and polyurethane resin systems.	2034
Retor Developments Ltd. Argyll Rd. Galt, Ontario, Can. Hydraulic tracer controls for machine tools.	2018
Richard Brothers Punch Div., Allied Products Corp. 26500 Capitol Ave. Detroit 39, Mich. Interchangeable punches and die buttons, punch and die retainers, die makers supplies.	1548
Richards, J. A., Co. 903 N. Pitcher St. Kalamazoo, Mich. Benders, sawing machines.	1834
Riggs, William L., Co. 565 S. 127th Ave., E. Tulsa 12, Okla.	2007
Robbins, Omer E., Co. 11961 Dixie Ave. Detroit 39, Mich. Magnetic and nonmagnetic sine plates.	1661
Robinson Aviation Inc., Teterboro, N. J. Vibration and shock control mountings.	841
Ross Operating Valve Co. 120 E. Golden Gate Ave. Detroit 3, Mich.	814
Rotor Tool Co., The 26300 Lakeland Blvd. Cleveland 32, Ohio	1832
Rouse, H. B., & Co. 2214 N. Wayne Ave. Chicago 14, Ill. Hand miller and fixture setups.	1152
Rowe Machinery & Mfg. Co., Inc. 1506 N. Industrial Blvd. Dallas 7, Texas	800
Royal Master Inc. State Hwy. No. 23 Riverdale, N. J.	1953

exhibitors list

Booth No.

Royal Oak Tool & Machine Co. 519
29800 Stephenson Hwy., P. O. Box 111
Royal Oak, Mich.
Universal hand operated and motor powered form relieving fixtures, bench grinder and optical comparator, grinding accessories, electrical discharge units.

Russell, Holbrook & Henderson, Inc. 1570
292 Madison Ave. New York 17, N. Y.

Ryerson, Joseph T., & Son, Inc. 1036
16th & Rockwell Sts. Chicago 8, Ill.

— S - Sp —

Sales Service Machine Tool Co. 2035
2363 University Ave. St. Paul 14, Minn.
OBI deep throat power presses, bench presses, power hacksaws and die filers.

Sandex Automation Inc. 1934
678 Berriman St. Brooklyn 8, N. Y.

Sandvik Steel, Inc. 2118
1702 Nevins Rd. Fair Lawn, N. J.
Carbide-tipped tools, blanks, inserts, toolholders, and milling cutters.

Scharmann Machine Corp. 1015
337 Boulevard of the Allies
Pittsburgh 22, Pa.
Horizontal boring and milling machines.

Schauer Mfg. Corp. 1177
4500 Alpine Ave. Cincinnati 42, Ohio
Lathes and bench grinders.

Scherr, George, Co., Inc. 445
200 Lafayette St. New York 12, N. Y.

Schrader's, A., Son, Div. Scovill Mfg. Co. 1634
470 Vanderbilt Ave. Brooklyn 38, N. Y.

Schramm, Inc. 1237
West Chester, Pa.

Scott Paper Co. 1935
Front & Market Sts. Chester, Pa.

Screw Machine Publishing Co. 2049
65 Broad St. Rochester 14, N. Y.

Scully-Jones & Co. 1635
1901 S. Rockwell St. Chicago 8, Ill.
Tap and screwdrivers, clutches, spindles and adjustable adapters for multispindle machines, tool storage and control boards, counters and setting tools, quick-change chucks and collets, holding tools.

Sealol Corp. 130
Warwick Industrial Pk.
Providence 5, R. I.
Dial indicating gages, chip ejector and coolant applicators, liquid and air transfer units.

Seewald, Inc. 1534
1952 Woodbridge Ave.
New Brunswick, N. J.

Segal, Edward, Machinery 539
72 Spring St. New York 12, N. Y.
Eyelet setting and eyelet setting and soldering machines, turret terminal and tube pin setting machine.

Company	Booth No.
Seibert & Sons, Inc. Chenoa, Ill. Multiple drill spindles, production tools and tool control units.	909
Selas Corp. of America Dresher, Pa. Furnaces for heating metals, automatic brazing and soldering machines and heat-treating furnaces and equipment, flame hardening equipment, high-temperature laboratory furnaces, gas flow indicating, gas and air mixing, and air and gas cleaning equipment.	1344
Sentry Co., The 62 Main St. Foxboro, Mass. High-speed steel hardening furnaces and atmospheric control.	436
Service Diamond Tool Co. 2505 Burdette Ave. Ferndale 20, Mich. Machines and accessories for Rockwell testing.	1059
Service Machine Co. 2310 W. 78th St. Chicago 20, Ill. Punch presses.	1345
Severance Tool Industries Inc. 728 Iowa Rd. Saginaw 1, Mich. Reamers, cutters, mills, countersinks, carbide hand files.	235
Sheffield Corp., The P. O. Box 893 Dayton 1, Ohio. Gages and measuring instruments; taps and dieheads; thread rolls; wheel dressing attachments; automatic sequence timers, machine control units, computers and recorders; press transfers.	222
Sheldon Machine Co., Inc. 4258 N. Knox Ave. Chicago 41, Ill.	724
Sheppard, Stanley 30 Church St. New York 7, N. Y.	1470
Sheridan Advertising Specialties 26032 Grand River Detroit 19, Mich. Circular calculator for fractions.	960
Sierra Machine Co. 4th & Dwight Way Berkeley 10, Calif. Flush and grinding arbors, and accessories for metal slitting saws.	2100
Siewek Tool Co. 2862 E. Grand Blvd. Detroit 2, Mich.	408
Simonds Abrasive Co. Tacony & Fraley Sts. Philadelphia 37, Pa.	312
Simonds Saw & Steel Co. 470 Main St. Fitchburg, Mass.	312
Simpson Optical Mfg. Co. 3200 W. Carroll Ave. Chicago 24, Ill. Optical measuring instruments.	625
Size Control Co., Div. of American Gage & Machine Co. 2500 W. Washington Blvd. Chicago 12, Ill. Plain, thread, plug and ring gages, truncated thread set plugs, thread and gear wires, snap and special gages, jigs, fixtures, master disks, inspection lights.	407
Skinner Chuck Co., The 95 Edgewood Ave. New Britain, Conn.	1448
Socony Mobil Oil Co., Inc. 150 E. 42nd St. New York 17, N. Y.	1339
Spiral Step Tool Co. 5400 N. Damen Ave. Chicago 25, Ill.	1475
Spitfire Tool Co. 2931 N. Pulaski Rd. Chicago 41, Ill.	1638
Spittler, Henry A., Inc. Route No. 208 Monroe, N. Y.	1904

– St – Sy –

Company	Booth No.
Standard Electrical Tool Co. 2488 River Rd. Cincinnati 4, Ohio. Precision spindles for routing, milling, grinding and boring; machine tool attachments; two-dimensional ball machine positioning table with tape control unit.	946
Standard Parts Co. 1000 Broadway Bedford, Ohio	1173
Standard Pressed Steel Co. Jenkintown, Pa.	322
Starlite Industries, Inc. S. E. Corner 58th & Market Sts. Philadelphia 39, Pa. Diamond rotary tools including mounted points and wheels, unmounted wheels, and segmented cutoff blades; core drills, carbide rotary tools.	1069
Starrett, L. S., Co., The 121 Crescent St. Athol, Mass. Hand measuring tools, dial indicators and gages, steel tapes, hacksaws, hole saws, band saws, and knives, ground flat stock, micrometer head, end measuring rods, magnetic base and indicator holder.	1401
Stetco Corp., The P. O. Box 2238 Little Rock, Ark. Cutting fluid for drilling, tapping, threading and reaming.	2138
Stewart-Warner Corp. 1826 Diversey Pkwy. Chicago 14, Ill.	544
Stimpson, Edwin B., Co., Inc. 70 Franklin Ave. Brooklyn 5, N. Y.	303
Stone Machinery Co., Inc. 316 Fayette St. Manlius, N. Y.	545
Stupakoff Div., Carborundum Co. Latrobe, Pa.	709
Suburban Machine Co. 5963 Harrison Ave. Cincinnati 11, Ohio. Jig boring and milling machines.	917
Sun Oil Co. 1608 Walnut St. Philadelphia 3, Pa.	640
Sunnen Products Co. 7910 Manchester Ave. St. Louis 17, Mo.	1438
Super-Cut, Inc. 3418 N. Knox Ave. Chicago 41, Ill.	1849
Superior Hone Corp. 1605 Elreno St. Elkhart, Ind. Honing machines, drill press honing attachments.	1670
Superior Pneumatic & Mfg., Inc. 4758 Warner Rd. Cleveland 25, Ohio. Air tools, including hammers, chisels and drills; air compressors and accessories.	1929
Superior Steel Products Corp. 2754 S. 19th St. Milwaukee 15, Wis. Die sets, leader pins, bushings.	505
Supreme Products Corp. 2222 S. Calumet Ave. Chicago 16, Ill. Drill, tap and ball bearing chucks; reversible speed reducer.	734
Swanson-Erie Corp. 814 E. Eighth St. Erie, Pa. Automatic assembly and process equipment, turret and straight-line indexing machine chassis, mechanical punch presses.	1575
Swedish Crucible Steel Co. 8801 Conant Ave. Detroit 11, Mich.	1068
Sykes Tool Corp., Ltd. Hwy. No. 7 Georgetown, Ont., Can. Helical, master and herringbone gears; gear cutting, shaping, hobbing, finishing, testing and measuring machines; shaper cutters, hobs, and finishing tools.	741
Syntron Co. Homer City, Pa. Vibratory parts feeders, vibratory and lapping machines.	2147

– T –

Company	Booth No.
Taft-Peirce Mfg. Co., The 32 Mechanic Ave. Woonsocket, R. I. Fixed gages; production and inspection equipment including V-blocks, angles, sine angle equipment, surface plates.	219
Tapmatic Corp. 845 W. 16th St. Costa Mesa, Calif.	969
Taylor Devices, Inc. North Tonawanda, N. Y.	958
Taylor Dynamometer & Machine Co. 6411 River Pkwy. Milwaukee 13, Wis. Balancing machine, automatic drilling machine.	430
Techni-Tool Products, Inc. 2517 W. Slauson Ave. Los Angeles 43, Calif.	1955
Techno Products Corp. 401 Dartmouth Ave. Swarthmore, Pa.	2136
Texas Co., The 135 E. 42nd St. New York 17, N. Y. Soluble, cutting, and heat-treating oils; hydraulic oils; forming and drawing lubricants and compounds; rust-proofing oils and compounds.	2019
Thomas Publishing Co. 461 Eighth Ave. New York 1, N. Y.	1260
Thor Power Tool Co. 175 N. State St. Aurora, Ill. Portable air and electric tools; air hoists accessories.	1845
Thread-All Sales Co. 1045 Perry Detroit, Mich.	1060
Tocco Div., Ohio Crankshaft Co., The 3800 Harvard Ave. Cleveland 5, Ohio. Induction heating equipment.	1304
Tomco, Inc. P. O. Box 170 Racine, Wis.	744
Tomkins-Johnson Co., The 617 N. Mechanic St. Jackson, Mich. Air and hydraulic cylinders, riveting and nutsetting machines, die sinking milling cutters, replaceable head reamers, air valves.	1423

Booth No.

Tool Engineer, The — 2151
10700 Puritan Ave. Detroit 38, Mich.
Official publication of The American Society of Tool Engineers.

Torit Mfg. Co. — 1349
292 Walnut St. St. Paul, Minn.
Dust collectors and separators, diamond collector.

Tork-Mor, Inc. — 335
4845 Bellevue Detroit 7, Mich.

Torrington Co., The — 1216
59 Field St. Torrington, Conn.
Automatic hydraulic rotary swaging machines.

Transmares Corp. — 617
15 William St. New York 5, N. Y.

Tri-Ordinate Corp. — 1301
343 Snyder Ave. Berkeley Heights, N. J.
Deburring and three-dimensional contour milling machines, spline and gear cutters.

True-Trace Sales Corp. — 2135
9830 E. Rush St. El Monte, Calif.

Tubular Micrometer Co. — 445
301 Armstrong Blvd. N. St. James 1, Minn.
Measuring instruments, small hand measuring equipment.

Tubular Rivet & Stud Co. — 1717
Weston Ave., Wollaston (Quincy), Mass.

Twentieth Century Mfg. Co. — 2114
Route 176 & Bradley Rd. Libertyville, Ill.

– U – V –

Uddeholm Co. of America, Inc. — 330
155 E. 44th St. New York 17, N. Y.
Tool and die steels, strip steel, seamless steel tubing, carbide tipped rock drill rods, hardness tester.

Union Mfg. Co. — 422
296 Church St. New Britain, Conn.
Power and manual chucks, die sets, ground steel plate, stock reels, V-block parallels, rotary air and air fixture tables, vises.

United States Gypsum Co. — 2015
300 W. Adams Chicago 6, Ill.

United States Rubber Co., Mechanical Goods Div. — 1233
1230 Avenue of the Americas New York 20, N. Y.

United Tool Co. — 1220
303 U. B. Bldg. Huntington, Ind.

Universal Mfg. Co. — 1905
410 Hillside Ave. Hillside 5, N. J.

Upton Bradeen & James Inc. — 1534
890 Yonge St. Toronto 5, Ont., Can.

U. S. Burke Machine Tool Div. — 1261
Brotherton Rd. Cincinnati 27, Ohio

U. S. Tool Co., Inc. — 1554
255 N. 18th St. Ampere (East Orange), N. J.
Air and motor driven slide feeds, stock straightener, coil cradle, stock reels.

Vaill Engineering Co., The — 508
137 E. Main St. Waterbury 20, Conn.
Tube end forming machines for beading, flaring, flanging, sinking, expanding, grooving, threading and reducing.

Booth No.

Valenite Metals Div., Valeron Corp. — 644
31100 Stephenson Hwy. Royal Oak, Mich.

Valvair Corp., Sinclair Collins Valve Co. — 540
454 Morgan Ave. Akron 11, Ohio
Manual and mechanically operated air, vacuum and low-pressure hydraulic control valves; single and double solenoid pilot operated control valves; in-line valves, and manifolds for pilot operated valves.

Vanadium Alloys Steel Co. — 533
Latrobe, Pa.

Van Keuren Co., The — 419
176 Waltham St. Watertown 72, Mass.
Plug gages, thread and gear measuring wires, gage blocks, optical flats, monochromatic lights, light-wave micrometers.

Vascoloy-Ramet Corp. — 1035
800 Market St. Waukegan, Ill.
Toolholders for throwaway inserts, carbide face mill, ceramic throwaway inserts; carbide cutting tools and products, carbide dies.

Veet Industries — 1262
25753 Groesbeck Hwy. East Detroit, Mich.
Radial drilling machines, spacer tables.

Vernon Devices, Inc. — 1909
481 E. Third St. Mt. Vernon, N. Y.
Deburring devices.

Vlier Engineering, Inc. — 957
8900 Santa Monica Blvd. Los Angeles 46, Calif.

Vulcan Tool Co., The — 1404
730 Lorain Ave. Dayton 10, Ohio

– W – Z –

Wachs, E. H., Co., The — 1210
1525 N. Dayton St. Chicago 22, Ill.
Hand and power hacksaw blades; portable power driven hacksaws.

Wadell Equipment Co., Inc. — 1816
159 Terminal Ave. Clark, N. J.
Vertical and horizontal, single and double end boring machines, automatic indexing tables, automatic retracting boring bars, boring spindles.

Wales-Strippit Co. — 1622
Akron, N. Y.
Punches, dies, springs and drilling machines.

Walker, O. S., Co., Inc. — 1947
Rockdale St. Worcester 6, Mass.

Warner & Swasey Research Corp. — 1756
34 W. 33rd St. New York 1, N. Y.

Watson Publications, Inc. — 963
201 N. Wells St. Chicago 6, Ill.

Watts Regulator Co. — 967
10 Embankment St. Lawrence, Mass.
Air line filters, regulators and lubricators.

Webber Gage Co. — 302
12900 Triskett Rd. Cleveland 11, Ohio

Weisser Machinery Corp. — 1028
1539 W. Elizabeth Ave. Linden, N. J.

Wells Mfg. Corp. — 1713
407 E. Jefferson Three Rivers, Mich.
Portable and heavy-duty metal-cutting band sawing machines.

exhibitors list

Booth No.

Wesson Co. — 1516
1220 Woodward Hts. Blvd. Ferndale 20, Mich.
Cemented carbide cutting tools and inserts, blades, tips, blanks, shapes and forms; universal angle vises and tool components.

West Point Mfg. Co. — 1757
26935 W. Seven Mile Rd Detroit 19, Mich.

Westwood Machine Tools Canada, Ltd. — 1948
66 Swayne St. Cobourg, Ont., Can.
Automatic recessing and grooving tools, rapid change toolposts.

Whistler, S. B., & Sons, Inc. — 1525
752 Military Rd. Buffalo 23, N. Y.
Adjustable and magnetic perforating dies.

Whiton Machine Co., The — 1163
190 Howard St. New London, Conn.
Air-operated chucks and cylinders, hand operated chucks and chuck jaws.

Wickman Mfg. Co., The — 1405
10325 Capital Ave. Oak Park 37, Mich.

Williams, J. H., Co. — 2009
400 Vulcan St. Buffalo 7, N. Y.
Wrenches, toolholders and setup accessories, C-clamps, hand tools, hoist hooks, fastening devices, pipe tongs and vises, flange-jacks. Special ferrous and non-ferrous drop and press forgings.

Wilson-Carr, Inc. — 1908
407 S. Dearborn St. Chicago 5, Ill.

Wilson Mechanical Instrument Div., American Chain & Cable Co., Inc. — 309
929 Connecticut Ave. Bridgeport 2, Conn.
Automatic and manual hardness testers, hydraulic press.

Wilton Tool Mfg. Co., Inc. — 1945
Schiller Park, Ill.

Wintriss, Inc. — 1921
20 Vandam St. New York 13, N. Y.
Circuit overload detector and power press, press and feed controls.

Wisconsin Drill Head Co. — 1760
4987 N. 124th St. Butler, Wis.
Drilling and tapping heads, and tapping machines.

Woodworth, N. A., Co. — 412
1300 E. Nine Mile Rd. Ferndale 20, Mich.
Diaphragm chucks, arbors, jigs and fixtures, inspection combinations and gages; machining and heat treating.

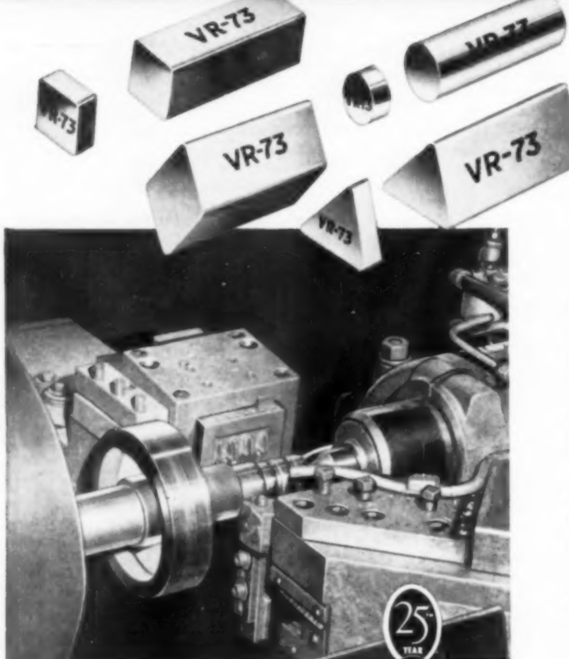
Zagar, Inc. — 1738
24000 Lakeland Blvd. Cleveland 23, Ohio
Boring, drilling, reaming and tapping machines; drilling and tapping heads; broaching machines; master collets; collet and lathe chucks; indexing fixtures; collet type holding fixtures.

Zeiss, Carl — 438
485 Fifth Ave. New York 17, N. Y.

LOOK

Here's your answer to machining "Superalloys"

VR-73



A Superior Steel-Cutting Cemented Carbide

- **Hardness: 92.0 Rockwell "A"**
- **Transverse Rupture Strength: 225,000 psi**
- **Density: 11.68 gms. per cc.**

VR-73—the newest V-R high quality steel-cutting carbide—combines higher edge strength with greater resistance to heat and abrasion—qualities never before available.

Outstanding for all types of general semi-finish and finish machining of the high tensile, high heat-resistant alloys—the superalloys—for missiles, rockets and jet engines!

Maximum performance is assured by its composition, grain structure and exceptional purity. Vascoloy-Ramet's exacting quality control procedures always make a constant, superior, uniform product.

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'58
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Vascoloy-Ramet Corporation

SUBSIDIARY OF FANSTEEL METALLURGICAL CORPORATION

886 Market Street • Waukegan, Illinois

C-656

PROGRESS IN PRODUCTION

CHARGED PAINT SPEEDS COATING JOBS

Electrified paint is utilized in a system at General Electric's Foundry Dept. Elmira Foundries that saves an estimated $25,000 yearly in paint costs alone. Painting apparatus, part of a $75,000 modernization program at Elmira, adapts the theory of negative charge of electricity flowing toward a positive charge.

When in operation, castings are placed on conveyor hooks which form a tight loop around an atomizing disk. The disk, charged with a high voltage electrical current, moves up and down on a reciprocating shaft.

Paint is fed onto the surface of the disk as it rotates at high speed. Centrifugal force carries the paint to the edge of the disk where it is hurled off in tiny droplets, each of which carries an electrical charge. The "electrified" paint seeks a metal surface on which to ground the electrical charge, and travels directly to the castings which are passing by the disk.

All of the surfaces of the castings are exposed to the paint because of the up-and-down action of the spinning disk and by rotation of the conveyor hooks which support the castings.

There is no overspray, since practically all of the "electrified" paint is attracted to the castings; consequently, paint waste is negligible.

Because some of the castings may have recesses or masked areas which are difficult for the automatic system to reach, there is a hand spray station for touch-up purposes.

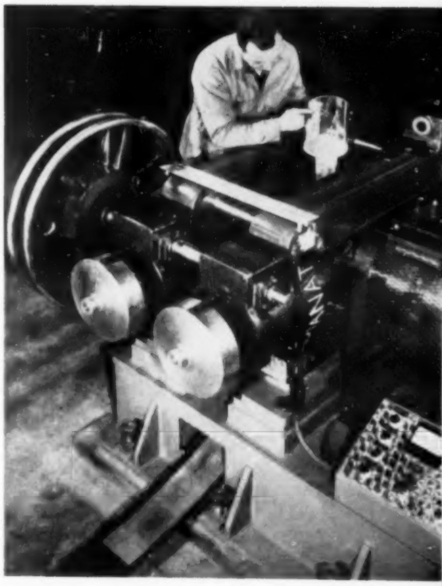
MILL MAKES SHEET FROM METAL POWDER

Sheet and strip can be compacted directly from metal powders in a newly developed horizontal rolling mill. The mill also is convertible to a vertical 2-high/4-high combination mill.

For the metal powder rolling operation, the mill produces both ferrous and nonferrous materials in widths up to 7 inches and thicknesses ranging from $\frac{1}{32}$ to $\frac{1}{8}$ inch, depending on the particular metal powder being processed. In performance tests the machine successfully compacted such widely diverse metal powders as aluminum, stainless steel, molybdenum and tungsten.

Research, development and pilot production activities concerned with the fabrication of such critical items as nuclear fuel elements, aircraft filtration systems and new alloys for rockets and ballistic missiles undoubtedly will benefit from this machine developed by Stanant Mfg. Co., Inc.

Metal powder for the compacting-by-rolling technique, is merely poured between revolving rolls and a solid, uniform mass produced. Several variables such as roll diameter, roll gap and roll speed, determine strip qualities. Only a small amount of trial-and-error experimentation is required to achieve desirable strip formation of a given metal powder sample. Different methods of introducing material to the rolls may be employed by various hoppering techniques aided by vibrators for uniform feed rate.



Laminations may be produced by directing streams of dissimilar powders into the roll gap. Powder also may be compacted between strips of wrought metal to form a sandwich as is sometimes done in manufacture of certain types of nuclear fuel elements. Impregnation of cloth with powder has been successfully carried out. Initial experimental feeding may also be done manually, with hoppering for high production.

Material thickness is determined to a great extent by roll diameter and also by screwdown setting which controls the gap between the rolls. Certain powder samples are produced in strip thicknesses corresponding closely to the opening between rolls, whereas others may have twice or three times the thickness measurement of the roll gap through which the particles were

fed. Roll speed also has an effect, particularly on density.

Unusual flexibility of design permits the substitution of both wider and larger diameter rolls. For example, 10-inch diameter by 12-inch face width rolls can be used instead of the 8 x 8 inch rolls with which the mill has initially been equipped. Capacities thus can be increased to produce sheet widths up to 11 inch and thicknesses in excess of $\frac{1}{8}$ inch with certain metal powders.

Both hot and cold rolling operations are possible with the Model TAH-625. High temperature resistant rolls equipped with electric cartridge heater elements can be supplied.

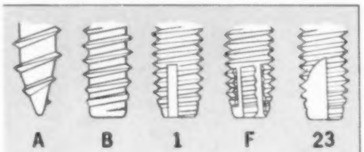
For powder rolling operations, the rolls are arranged in a horizontal plane and a chute is provided on which the resultant strip is carried from the rolls. Width of the strip is controlled by side platens which are adjustable over the width of the rolls; this allows formation of strip from $\frac{3}{4}$ inch up to almost the face width of the compacting rolls.

STUDY OF SCREW DESIGN IMPROVES SELECTION

Easier assembly plus greater assurance of a sound joint can be achieved through analysis of design factors instead of using conventional rules of thumb in the selection of tapping screws. According to fastener specialists at Russell, Burdsall & Ward Bolt and Nut Co., there are five common types of tapping screws: two are thread forming and three are thread cutting. The thread forming screws, types A and B illustrated, should be used when the material is ductile enough to permit the deforming action of the screw. Type A is pointed and used in pierced rather than drilled holes and where the exposed point doesn't matter.

When hardness or thickness of material requires too much driving effort for types A or B screws to be used, one of the thread cutting screws, types 1, F, 23 and 25, should be used. For hard, ductile materials, type 1 is best; for soft, friable materials, type 23 or 25. Type F, which has four equally-spaced longitudinal slots, drives straighter than the other types.

Where load is no factor, thickness of the metal determines screw diameter. A screw with thread pitch that will



give at least one full thread engagement in the metal should be used. For example, with metal 0.0625-in. thick, any screw with at least 16 threads per inch can be used.

Where load is a factor, the screw should be chosen on the basis of sufficient strength and greatest thread engagement—four or five threads fully engaged, if possible. If the screw that is large enough to develop sufficient holding power doesn't provide sufficient thread engagement, a greater number of smaller screws should be used.

Size of hole in the metals to be joined is important. If the hole is too large, the screw cannot develop sufficient thread depth; if it is too small, the screw will be difficult to drive. Required hole size will vary with the thickness of the material, type of material and style of screw.

NEW MOLDING TECHNIQUE NETS HIGH ECONOMY

Report has it that as much as 25 percent of manufacturing costs can be saved through a new plastic injection molding technique. For the "pre-compression" method, known as valve gating, material is held in a reservoir, building up pressure that releases the valve and causes the material to gush into the cavity at high velocity. This is in contrast to the normal injection molding method which is carried out when molten material begins to ooze through an opening into the mold cavity. One of the advantages of the new method is that it permits multiple valve gating which enables consider-

Operator demonstrates valve gate technique of molding which provides economies through reduced weight of the molded part and a higher degree of automatic molding.

ably smaller machines to be used for molding larger and deeper pieces with greater areas. In some cases according to Columbus Plastics Products, Inc. who developed and patented the technique, valve gating will make it possible to mold a piece which could not otherwise be molded, regardless of press size.

The Polymer Chemicals Div. of W. R. Grace & Co., which has an exclusive license on the process, has done extensive work in its own laboratories with GREX high-density polyethylene. Engineers there predict that the technique will alter molding of all thermoplastic materials as well as high-density polyethylene.

They point out that greater economy of operation results from reduced molding cycles and considerably decreased scrap and rejects, as well as less finishing costs. Improved products they say are made possible through good physical properties as well as reduction of overall shrinkage.

LIGHT 'CURTAIN' SAFEGUARDS PRESSMEN

A broad beam of light, up to 18 inches high, thrown across the danger area of the press is reported to bring about production increases of up to 140 percent.

If this continuous light beam, thrown by a Curtain of Light projector, is broken at any place—even by the thickness of a man's wrist—the press is automatically stopped. When the operator's hand is withdrawn to a safe position, the press can be tripped automatically. As a consequence, the operator can be reaching for new stock instead of pressing the pushbuttons.

The wide light beam, according to

Electronic Control Corp., is used primarily on presses that can be stopped instantaneously, such as hydraulic or friction-clutch machines. Installations include OBI's straight side, punching, forming, welding presses, and broaching machines. The Curtain of Light also may be used to prevent accidental tripping of mechanical "dog clutch" presses, providing they operate at 100 strokes per minute or faster.

The equipment consists of a projector, a receiver, and a control unit. Projector and receiver housings are usually bolted directly to the frame of the press or to the floor. Shock mounts isolate the lamps and tubes from the machine's vibration. The control unit features plug-in components for easy servicing.

Equipment is fail-safe in that it continuously and automatically checks its own operation. The press can operate only as long as the Curtain of Light

is in working order. Should any part fail, power be removed, or an attempt made to "cheat" the equipment, the press is automatically stopped.

The operator works without interference from obstructing guards or a special safety routine. Further, the simple, smooth, natural hand motion reduces fatigue.

MINIATURE MACHINES ALLOW ECONOMICAL TRIALS

Engineers, machine designers, scientists, inventors and automation specialists are making precision working models of practically any type of machine, drive or mechanism with a special machine construction kit that uses a basic construction concept of round rods and beams that are assembled into frameworks by a clamping technique. A wide variety of precision-machined mechanical components such as ball bearings; spur, bevel, internal and worm gears; gear racks; ratchets; sprockets; pulleys; sheaves; couplings; springs; wheels; disks and universal joints are utilized in the system developed by FAC Div.

Thus, it is possible to construct smooth-operating, precision-detailed mechanisms with standard kit components.

Not only does it permit development of new ideas and creation of machines and mechanisms in design work, but models made with the kit can be used to prove mechanical concepts.

Resultant models possess such qualities of large production equipment that they can be used as machines and test equipment for research and development work.

The FAC construction system was created by a Swedish inventor, Mark Sylwan, who saw in the method a means of constructing and proving machines and mechanisms which would avoid large development program expenditures on machines whose principles had not been thoroughly substantiated.

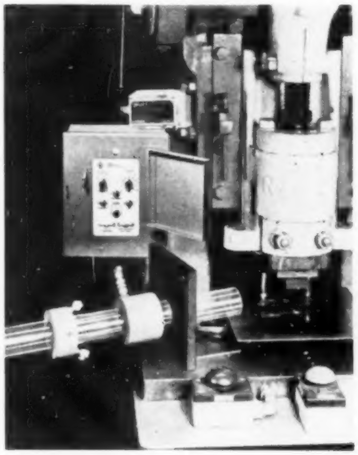
TOOLS *of today*

Press Control

Double-heading of punch presses is avoided by an electronic press control which stops the press from completing its stroke whenever the stamped piece is not properly ejected from the die.

The control is comprised of a control panel, whose contacts are connected to the press circuit, and a detection unit which consists of a high radio frequency coil mounted on a Cadco cast acrylic tube. The acrylic tube is electronically as well as optically transparent.

The detection unit is attached at the die-face, next to the ejection point. As each piece is ejected, a stream of com-



pressed air blowing through the tube draws the part through the coil, breaking the radio frequency field and thereby closing a set of contacts in the control panel. When a piece fails to eject in the required time, the contacts open and the press stops. With the electronic controls on duty, an operator may control more than one press. The press control unit may also be used to automate the press and to count stamped parts.

The "Die-Saver" control may be installed on any punch press with dog, pin or air clutch which is electrically operated or can be modified to electrical operation. The electronic sensing circuit may be adjusted for variations in press speeds and size of stamping through a set of adjustable controls.

Robotron Corp., 21300 W. Eight Mile Rd., Detroit 19, Mich. **T-4-1**

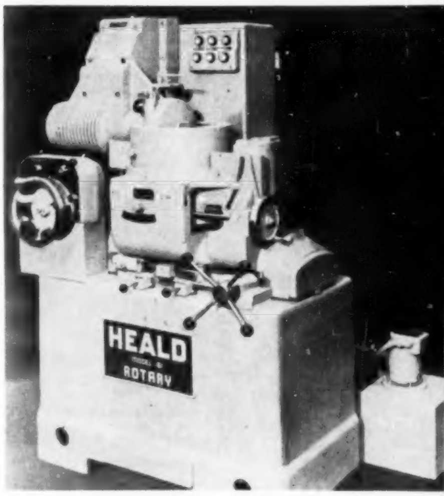
Rotary Surface Grinder

Suited particularly to small work grinding operations on high production or job-lot basis, Model 161 rotary surface grinder machine grinds flat, convex or concave surfaces of work up to 6 in. OD. The column type machine can produce finishes of 2 to 4 microinches in suitable types of material in routine production, and will accommodate a wide range of relatively small work.

Operating cycle of the machine is hydraulically controlled. Automatic table reciprocation permits high, uniform production on relatively long runs of identical parts. Hydraulic table feed rates are infinitely adjustable from 0 to 10 fpm to permit smooth, slow dressing speed and instant change to rapid traverse or reciprocating speed. Model 161 also is available as a manually-operated machine which can be changed over to hydraulic operation by addition of a power pack.

The 6-in. magnetic chuck can be swiveled 15 deg for precision grinding of convex or concave surfaces. The unit has a 10-in. vertical capacity to center of wheel, 4-in. grinding stroke and 12½ in. swing inside of the guard. Provision is made for wet grinding operations.

A dial knob type feed box permits



incremented vertical feeds of 0.0001 in. from 0 to 0.0006 in. for rough grinding, changing automatically to 0.0001-in. fine feed at any point from 0 to 0.005 in. before finish size.

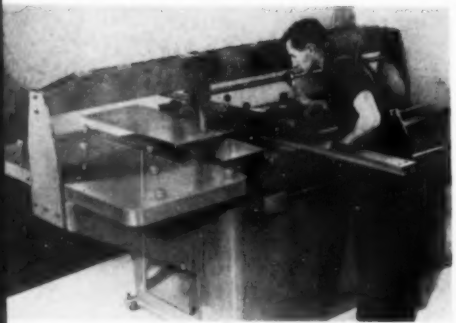
Wheelhead drive motor is built into the end of the wheelhead spindle to eliminate belt drive and provide more power for heavy stock removal.

The Heald Machine Co., Worcester 6, Mass. **T-4-2**

Template Machine

Holes 1/16 to 3/8-in. diam can be located and drilled in templates to within ±0.002 in. with a compact Coordinator machine which also can be used for producing drill jigs, simple fixtures and other precision work in flat sheet metal or plate. It is particularly suited for producing templates up to 36 x 42 in.

Using a simple X and Y chart for hole locations, the operator can set the dimensions quickly with two optical scanners in conjunction with fixed



scales. Any number of holes of uniform size can be located and drilled in rapid sequence. There is no accumulative error since all dimensions are from a zero reference point to X and Y coordinates.

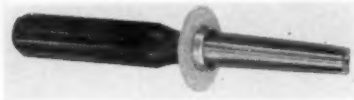
Hicks Coordinator Div., Wiedemann Machine Co., 726 Wissahickon Ave., Philadelphia 32, Pa. **T-4-3**

USE READER SERVICE CARD ON PAGE 267 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Taper Chuck Cleaner

A taper chuck cleaner is available to facilitate cleaning spindles, quills and sockets on machine tools and drill presses.

The tool utilizes static action of plastic blades with the aluminum shaft, which holds the blades, to attract and hold all chips and grit present in chucks. The blades will not mar or



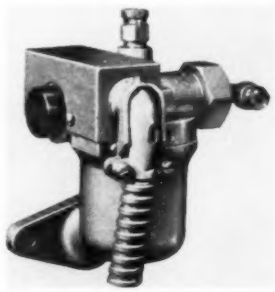
scratch machinery, the tool is not affected by oil or coolants and the small shield protects hands.

The tools are available in Morse Taper sizes No. 1 through 5, Brown & Sharpe sizes 6, 7 and 12. Replacement blades also are available.

James Products Co., 801 Mentor Ave., Mentor, Ohio. **T-4-4**

Safety Device for Air Compressors

A protective device, called Oil Monitor, prevents recycling when compressor crankcase oil level falls below a safe limit. The device employs a microswitch which makes it impossible for the compressor to start a new cycle unless sufficient oil is present for lubrica-



tion. Should recycling be started manually by pushbutton, the compressor will cut off automatically at the next cycle until oil is added to bring the crankcase level up to standard.

Compressors in the company's line, from $1\frac{1}{2}$ to 10 hp, are fitted with this safety device.

Champion Pneumatic Machinery Co., Princeton, Ill. **T-4-5**

Coolant Equipment

All necessary controls plus air filter, trap, regulator and gage, solenoid valve and conduit box, pressurized coolant reservoir and filter, are incorporated in a single, compact Spraymist coolant

unit. The Solenoid valve connected to the machine circuit starts Spraymist when the machine is turned on.

Pressurized coolant reservoir permits mounting in any location without siphon-lift problems, air waste, or interrupted flow.

A needle valve control in the Spraymist jet permits a range of settings from superfine mist to heavy spray. One unit

can supply up to 10 or more jets by branching from existing lines. Three types of jets are available, and replacement jet tips can be installed in seconds. Full assortment of hose assemblies, "T" blocks for multijet installation, plus three solenoid voltage ratings simplify installation.

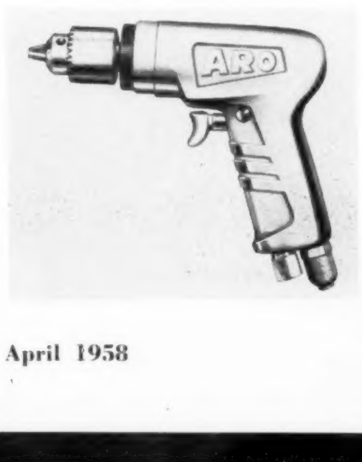
Units are available in 1-gal and 18-oz capacities.

Bijur Lubricating Corp., 151 W. Passaic St., Rochelle Park, N. J. **T-4-6**

Air Tools

Light and medium-duty type drills, screwdrivers and tappers incorporate noiseless, blastless exhaust.

Exhaust air is routed back through a system roughly parallel to the inlet system, and escapes at a point adjacent to the air inlet. A porous bronze diffuser, located at the outlet, deadens any remaining exhaust noise and dissipates the escaping air evenly in all directions.



An exhaust deflector, available as optional equipment in place of the diffuser, may be used where it is necessary to concentrate exhaust air in a single direction. The deflector is equivalent to the diffuser in noise elimination, and can be turned to any position within a 360 deg plane.

The diffuser may also be replaced by a standard air hose of any length, for the purpose of venting exhaust air at a point well removed from the operator.

The Aro Equipment Corp., Bryan, Ohio. **T-4-7**

Marking Machine

Pantograph controlled toolroom machine performs milling, machining, routing, drilling, spot facing, grinding, slotting, lapping, indexed milling and engraving on all metals and plastics. It is simple to operate, and a relatively inexperienced operator can quickly learn to produce quality parts with the machine at high production rates.

Contruction includes a 2 x 28 x 60 in. base table, ⅓-hp a-c motor (60 cycle, 110 or 220 volt, allowing 500 to

6,000 rpm in six stages), closed spindle and quill unit, dash pot, subtable and a ratio setting slide (maximum ratio is 8:1 down; inverse ratio is 1:3), light and coolant pump. The machine has a 22-in. reach from the column, 18-in. swing and a $9\frac{1}{2}$-in. clearance under the cutter. Tolerances of ± 0.0005 are

readily held with a properly made master, and the roller stylus has been developed for speed as well as precision.

Mill All, 8 E. Prospect Ave., Mount Vernon, N. Y. **T-4-8**

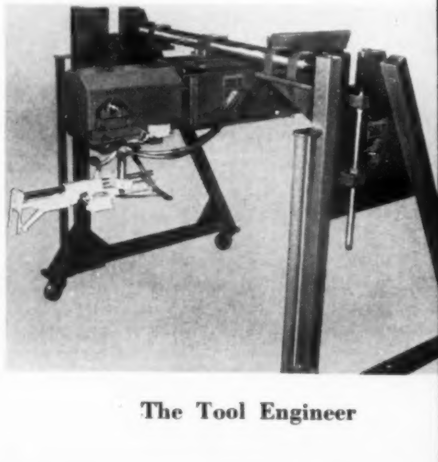
USE READER SERVICE CARD ON PAGE 267 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Press Unloader

A compact horizontal press unloader, called the 6000 Series horizontal Iron Hand, has overall length of only 18 in. more than the length of the stroke. Models range in stroke length from 36 in., with speeds up to 40 strokes per minute.

A geared non-slip belt, in place of roller chains or rack and pinions, needs no lubrication.

The unloader can be mounted on the press upright, on a conveyor or on a universally adjustable rollaway base. With the jaw assembly removed, it can also be used as a power unit for a parts



feeder or transfer mechanism.

A universally adjustable jaw permits grabbing of the piece at any angle, while extra-long cylinder cushions assure smooth extracting action.

Many components including jaw assembly of the new extractor are interchangeable with those in the standard Iron Hand.

Sahlin Engineering Co., Inc., P. O. Box 289, Birmingham, Mich. **T-4-9**

Multiple Air Gage

A modular air-electric meter switch, Model EAS-1058, speeds measuring of multiple dimensions. When several of these units are assembled for measuring multiple dimensions simultaneously, they are arranged so that the operator needs to watch only a single signal light which, when on, indicates that all dimensions are within tolerance. In addition, each of the individual meter units contained in the gage is equipped with two lights which not only signal an off-size dimension but indicate whether the part is suitable for salvage or scrap. A meter hand shows exactly how much the off-size dimension deviates from tolerance.

Federal Products Corp., Providence, R. I. **T-4-10**

Vertically Opposed Production Machine

Deburring, chamfering, spot facing, drilling and tapping, or a combination of the two, reaming and other related

machining operations are possible individually, simultaneously or in sequence with this automatic machine.

Designed for opposed operation, the machine can be used with a small index

table, manual or air clamp fixtures, hopper or vibration feed. It also is suitable for deburring or chamfering both sides of holes in thin sections. Fixtures or tooling locate quickly and accurately in precision machined cross-slots on table.

Incorporated in the machine are two Dumore automatic drill units; these have drilling capacities of $\frac{3}{8}$ in. and tapping capacities of $\frac{1}{2}$-13 in mild steel at 10 speeds from 400 to 7420 rpm by interchanging pulley combinations. Controlled feed range is up to 60 ipm, rapid approach rate is 600 ipm, and return rate 300 ipm.

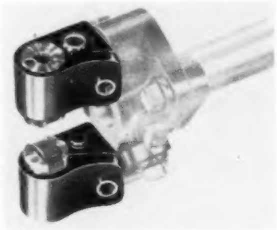
Maximum spindle stroke of each unit is 3 in. while the largest opening possible between chucks at rest position is 22 in. Both units and table are adjustable vertically. Normal spindle alignment from tool to tool is within 0.003 although dead center alignment is possible by adjustments.

R. E. Ellis Engineering Co., 5001 W. Fullerton Ave., Chicago 39, Ill. **T-4-11**

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-4-244

Knurling Attachment

With the addition of this knurling accessory, a turning tool can produce either straight or diamond pattern knurling with knurls adjusted to any angle. One hex wrench makes all adjustments. Knurls may be changed



without removing the tool from the turret.

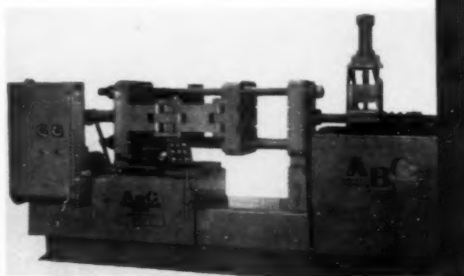
Construction of the accessory is heat-treated alloy steel to insure maximum strength. All holes are ground for accurate alignment. The unit operates as a rigid and durable accessory when used with the R and L turning tool.

R and L Tools, 1825 Bristol St., Philadelphia 40, Pa. **T-4-12**

Die Casting Machine

Model 5000 hydraulic zinc heavy-duty die casting machine has a capacity of 7-lb shot in zinc, and 150-ton locking pressure. Tie bars are $2\frac{1}{2}$ in. and steel platens are 24 x 24 in.

Extra large capacity melting furnace is provided. The machine is designed



for high cycling speed and is convertible to aluminum with a cold chamber attachment.

A B C Die Casting Machine Co., Dept. TE, 400 E. 142nd St., Dolton, Ill. **T-4-13**

Carbide Countersinks

Series 1704 countersinks are single flute, solid carbide cutters on steel shanks with included angles of 60, 82 or 90 deg. Three cutter diameters of $\frac{1}{2}$, $\frac{3}{4}$ and 1 in. are available for each included angle.

These tools, designed to sink holes

without chatter or tearing, will produce finishes comparable to a ground surface and are suitable for all materials except hardened steels. Countersinking can be done efficiently at spindle speeds from 150 to 500 rpm without injury to

cutter. They have ample chip clearance and easy regrinding characteristics.

The countersinks can be used down to 1/8-in.-diameter holes.

Atrax Co., 240 Day St., Newington, Conn. **T-4-14**

Indexing Table

The air-powered indexing table, called the Turretable, assures close working tolerances because the locating ports are relatively far (6½ in.) from the center of rotation. There are 4, 6 or 12 stations, with 3, 8 or 24 stations available on special order. The cylinder and track assembly length for 4, 6 or 12 stations is 32 in.

Motive power is applied to the rim of the turntable for maximum power

and steady movement. Because the mechanical locking mechanism is independent of the air supply, it will remain locked if the air supply fails.

Index speed at 12 stations is more than 3100 indexes per hour.

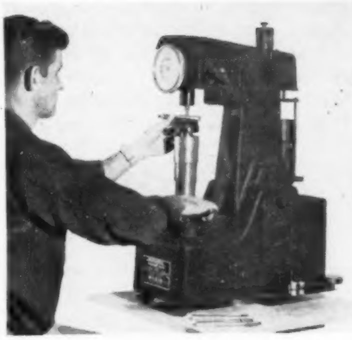
Mead Specialties Co., 4114 N. Knox Ave., Chicago 4, Ill. **T-4-15**

USE READER SERVICE CARD ON PAGE 267 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Hardness Tester

The TwinTester, a combination Rockwell and Rockwell superficial hardness testing instrument, can perform the work of two conventional single-range units in measuring Rockwell hardness of metals and alloys of all types, including hard, soft, polished or unpolished materials and round, flat, tubular or irregular shapes. The instrument will perform well in the hands of a production worker.

A large direct-reading dial gage has a single zero-set position which is marked with four scales: two to indi-



cate Rockwell hardness and two to indicate Rockwell superficial hardness readings. Separate colors facilitate reading. The operator can change from Rockwell to Rockwell superficial hardness testing procedures in a few seconds.

Vertical capacity is 8, 12 or 16 in. and throat depth is $5\frac{1}{2}$ in. Bench space required is approximately 12 by 20 in.

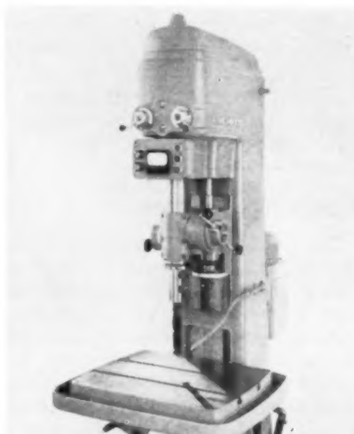
Wilson Mechanical Instrument Div., American Chain & Cable Co., Inc., Bridgeport 2, Conn. **T-4-16**

Sliding Head Drills

Infinitely adjustable spindle speed within the speed range of the drill is provided in the Infispeed sliding head drills, allowing exact speed required by drill diameter and work material to be obtained. Change of speeds is accomplished in seconds.

The drills are available in four sizes. Medium-duty models, built in single and multiple spindle, floor, bench and production box column models, are made in 16 and 24-in. sizes and have a 1-in. drilling capacity in cast iron.

Heavy-duty machines (illustrated),



with 1½-in. drilling capacity, are built in 21 and 25-in. sizes, box and round column, single and multiple spindle floor models.

Speed selection is accomplished through an adjustable speed pulley. On medium-duty models, the engaging diameter of the pulley is varied by a hand wheel; on the heavy-duty machines, by a fractional horsepower motor. The 21 and 25-in. sizes also have a back-geared drive to provide maximum torque in both high and low-speed ranges. A tachometer is mounted on all models to aid accurate speed selection.

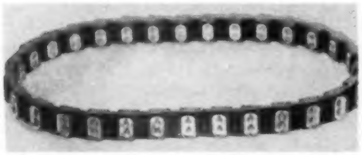
Medium-duty drills afford a spindle speed range froh 450 to 3000 rpm with the standard 1800 rpm 1-hp motor. Heavy-duty Infispeeds provide 60 to 1825 rpm spindle speeds with standard 1800 rpm 3-hp motor. Power feed with five feed rates from 0.002 to 0.015 in. is standard equipment on the heavy-duty drills. Power feed is optional on the medium-duty models. A positive stop is provided on all Infispeed drills.

Cincinnati Lathe and Tool Co., Cincinnati 9, Ohio. **T-4-17**

USE READER SERVICE CARD ON PAGE 267 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Link Belt

This speed belt can be adjusted to any length and installed without dismantling machinery. Made of oil and heat-resistant neoprene, the MVS belt is designed in a series of securely held



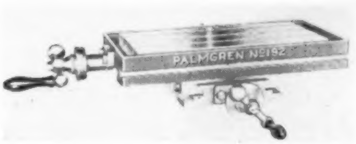
links. The belt is available in a wide range of sizes for vibration-free operation on most adjustable speed drives.

Manheim Mfg. and Belting Co., Manheim, Pa. **T-4-18**

Milling Table

Designed for use on drill presses, this cross slide milling table has a machined and ground work surface with center keyway and two T-slots. An extra T-slot is provided on one vertical side of the worktable which can be used to make an angle plate. The table is equipped with stops for both cross feeds, and a swivel base is available.

The No. 192 cross slide milling table is 18 in. long and 9⅝ in. wide. Longitudinal travel is 11 in. and cross feed is



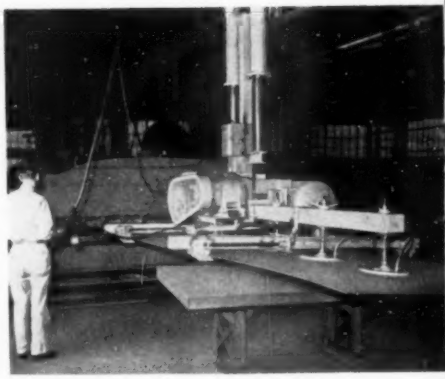
6½ in. Large, easy-to-read dials are graduated in thousandths.

Chicago Tool and Engineering Co., 8383 S. Chicago Ave., Chicago 17, Ill. **T-4-19**

Plate Handler

This one-man pushbutton plate and sheet handler is designed for attachment to cab or floor-operated overhead cranes. After installation of a permanent saddle on the crane trolley, the plate handler can be attached or removed from the crane in 3 minutes or less, permitting normal crane operation for other work.

In use, the operator lowers the han-



dler until its vacuum cups contact the plate, then pushes the hoist button. As the plate is raised, air-powered mechanical safety grabs automatically slide into place. Support columns are rigid to prevent swaying or swinging, and to permit accurate positioning of the plate on feed tables, ball points or pile. The plate can be picked up from or set down flat on the pile or floor without blocking, and is released at the touch of a button.

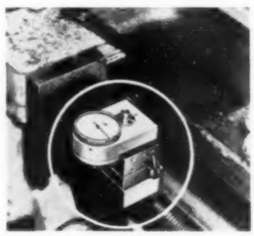
Standard lift capacities range from 1000 to 4000 lb.

Noble Co., Box 1979, Oakland 4, Calif. **T-4-20**

USE READER SERVICE CARD ON PAGE 267 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Machine Travel Indicator

An indicator for use with any machine tool measures longitudinal travel of the machine, as well as transverse and vertical travel on certain tools. The device, known as Trav-A-Dial, reads any length in 6-in. increments, and shows the record in inches, hundredths and



thousands on its dial. No plungers are used, and no measuring rods or other devices are required. Traverse is totalled on the indicator by recording revolutions of a slip-proof wheel which contacts the way of a lathe or any smooth surface of other tools. The instrument is accurate within 0.001 in. in 6 in. of travel and repeats accurately.

On lathes, the indicator enables operators to pick up all lineal measure-

ments without using stops or other measuring means.

With its spring-loaded, dovetailed mount, the instrument can be retracted when not in use. Installation requires only a bracket bolted to the machine.

M. E. Hodge Corp., 35 N. Raymond Ave., Pasadena 1, Calif. **T-4-21**

Driller-Reamer

A combination high-speed steel drill and reamer in one tool allows a single setup and handling in precision drilling and reaming operations.

Flutes of the tool, called Dreamer, are ground from solid M-2 #662 high-speed steel. Finished tolerances are

held to ±0.0001. Special deep flutes insure proper chip removal. Dreamers made from cobalt alloys for use on stainless steel also are available.

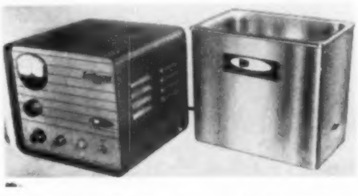
A complete range of sizes from $\frac{1}{8}$ to $\frac{5}{8}$ in. in divisions of $\frac{1}{64}$ in. are available in stock.

The Custanite Corp., 1228 Utica Ave., Brooklyn, N. Y. **T-4-22**

Ultrasonic Cleaner

The SonBlaster production size ultrasonic cleaner operates on 115 v. 60 cycle current, using any cleaning solution. The generator can activate a second tank if desirable.

Thirteen systems are available in this



600 Series which offer tank dimensions ranging from $6\frac{3}{8}$ x 7 x 9 to $10\frac{3}{8}$ x $12\frac{3}{4}$ x 9. Capacities are $\frac{1}{2}$, 1 and 2 gal.

The Narda Ultrasonic Corp., 160 Herricks Rd., Mineola, L. I., N. Y. **T-4-23**

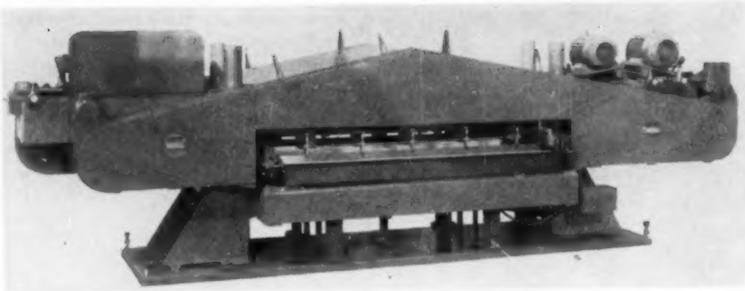
Sanding Machine

A straight line sanding machine uses a flat belt to produce a long scratch pattern. There is no possibility of ripple or chatter, and streaking is eliminated.

Two models of this machine, called the Smooth-Matic, are available. Both have an 8-ft length capacity (measured with the grain). Model 1000A-DB-8 ft with a 30-in. minimum width capacity, designed primarily for plywood and

wallboard, is a double belt roll feed polisher that incorporates powered pinch rolls for feeding sheets or panels through a two grit sequence. Model 1000C-DB-8 ft, the conveyorized version, is capable of handling stock as narrow as 1 in. wide.

Abrasive heads of the machine incorporate an 8 ft long air actuated platen, a contact pad belt and a 6 x 500 in. sanding belt. The series of graphite-canvas-covered sponge pads on the contact pad belt create sanding pressure across the entire length of the panel. The pads, traveling at 1000 fpm on the back of the abrasive belt, which travels at 5000 fpm, simulate the action of a stroking hand block or traveling head.



The polisher automatically measures the width of each panel and will sand various size panels as they are intermittently fed through the machine. The platen comes down to initiate sanding pressure when the leading edge of a panel is halfway under the belt. The platen stays down for the period of time that the panel is under the belt and automatically raises when the trailing edge is halfway out from under the belt, regardless of width and feeding speed. This action of the platen prevents possibility of dubbing or rounding the leading or trailing edges.

Curtis Machine Div., The Carborundum Co., Jamestown, N. Y. **T-4-24**

USE READER SERVICE CARD ON PAGE 267 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Steam Detecting Crayon

Temperature indicating crayons are available for instantly detecting faulty steam traps without the need of disconnecting the trap.

For example, in a 100-lb steam system, temperature of the steam is 338 F above the trap and should be about 298 F below the trap. A Tempilstik° for 300 F will not melt when applied about a foot below the properly operating trap, but will make a chalky mark on the return line.

However, a trap that is not working well, will permit live supply steam to "blow through" so that the temperature both above and below the trap is 338 F, and the 300 F Tempilstik° will leave a melted mark on the return line below the trap.

Tempil° Corp., 132 W. 22nd St., New York 11, N. Y. **T-4-25**

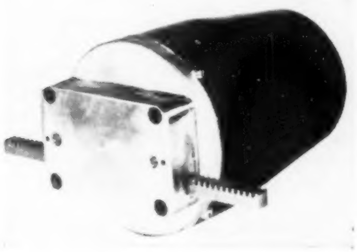
Linear Positioner

The Lineatrol linear positioner is a high-precision actuator for positioning applications where linear motion must be proportional to a control signal. Actually a gear motor, it has a built-in potentiometer to produce a remote indication of position or for use in automatic control circuits.

A Dialtrol position setter may be used for remote control of the component with linear position corresponding to dial setting. With precision multi-turn potentiometers, positioning accuracies of ±0.004 in. are provided for a 10-in. stroke with greater accuracies provided for shorted strokes. When furnished with a suitable controller,

linear position can be governed by a control signal originating from any transducer, with proportional adjustment available. The control signal may originate from a 3 to 15 psi signal, a 0.5 to 5 ma signal or from a variable frequency source.

Lineatrols, which may be face, bracket, foot or pivot mounted, achieve thrust



forces up to 1000 lb with a variety of stroke lengths and stroking rates. They may be furnished without the built-in potentiometer and is available with dynamic braking or tachometer feedback.

The Jordan Co., 3235 W. Hampton Ave., Milwaukee 9, Wis. **T-4-26**

Abrasive Disks

Abrasive disks and disk holders, called Shur-Stik, for flat or contour grinding and polishing operations, require no center nut. They are attached by a special adhesive on the back which allows the operator to quickly change disks.

The waffle backing on the disks will not cause them to stick or nest tightly together, but they will adhere tenaciously to the rubber holder when in use. The waffle backing permits the grain to flex slightly, thereby presenting more than one cutting edge to the work.

Shur-Stik abrasive disks are available in sizes from ½ to 20 in. diam and in a full range of grit sizes.

Coated Abrasives, Inc., 209 S. Second St., Milwaukee 1, Wis. **T-4-27**

Ultrasonic Gage

Thickness gaging, recording, detection of laminar flaws, including connections for automatic sorting and rejection, are possible with the rack-mounted Model R Vidigage. This self-contained equipment is comprised of ultrasonic resonance gaging and indicating circuitry, a strip chart recorder, gating and alarm circuits, and calibration control.

Power input of the unit at 60-cycle, 100-130 volt, A C, is 500 watt. For special requirements, 220-volt, 50 cycle equipment is available.

It will measure thickness of metals,

glass, and plastics between 0.005 and 2.5 in. Readings are obtained instantaneously by applying a transducer to one side of the work and reading the thickness indication on either or both the instrument's screen and/or chart.

The heart of this unit, a Model 14 Vidigage, detects the resonant frequency of the material under test and converts it directly into a thickness indication. No calculation is needed. The chassis holding the cathode ray tube and associated circuitry is removable, and can be installed in a standard carrying case for use in the field or on location.

The strip chart recorder clearly shows thickness changes which are barely visible on the screen. The recording pen is activated by an amplified signal proportional to the difference between the work thickness and some preset standard. Thus, a highly magnified profile of the surface is drawn on the moving chart. Accuracies as high as 1/50 of 1 percent have been achieved: Besides standard equipment, X-Y circular charts, multi-pen recorders, and other special recording apparatus are available.

The gating and alarm circuit trips a relay when a part reaches predetermined dimensional limits, energizing audible or visible alarms, marking devices or sorting attachments. Extra gating circuits can be added, without interfering with each other, to sort material into a number of thickness groupings.

The calibration checker produces up to 8 separate pips on the cathode screen, and marker lines on the recording paper, when the operator wishes to calibrate the instrument against a known sample.

Dept. T E, Branson Instruments, Inc., 40 Brown House Rd. Stamford, Conn.

T-4-28

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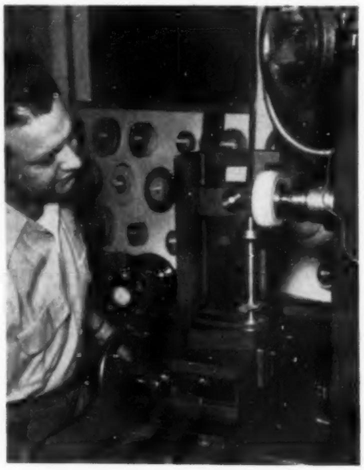
Motorized Centers

When used with a surface grinder, this motorized center unit makes possible concentricity and squareness accuracies of 50-millionths inch. The live center is mounted in a precision ball



bearing and is driven by a $\frac{1}{4}$-hp motor through a speed reducer; center speed is 78 rpm. By using a heavy-duty powerstat attachment, speed can be adjusted to achieve exact grinding speeds for different materials and diameters.

Either a high-speed steel or a car-

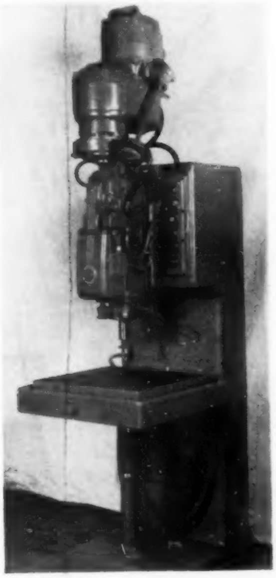
bide dead center is held in a movable slide. The unit is built in a stabilized cast-iron frame, accurately finished on one side and the bottom so the unit can be used vertically or horizontally. Tapers, forms, shoulders and surfaces of cyclindrical parts can be ground with the frame mounted on the table of a surface grinder. Tapers are accurately ground by using a sine plate with the unit.

Standard centers accommodate workpieces from 1 to 10 in. long; units for greater lengths can be obtained on special order. Maximum workpiece diameter is 7 in.

AA Gage Co., 350 Fair St., Detroit 20, Mich. T-4-29

Drill Presses

Spindle feeds, feed range, stroke, feed stroke and rapid approach are infinitely adjustable in a line of high-speed automatic-cycling drill presses. Both single and multiple-spindle models are available. Morris Air-Oil-Matic drill heads provide automatic cycling with fast approach and fast return for drill-



ing or tapping and positive stop with adjustable time delay for such operations as spot facing, counterboring, etc.

Type of operation is selected through an individual control station for each spindle. When the start button is pushed, the drill automatically goes through the selected cycle.

Adjustable speed drive provides infinitely adjustable spindle speeds with maximum spindle speed of 8000 rpm available on the standard machines. Seventeen different ranges of spindle speeds are available, and the speeds

within the range are infinitely adjustable with a ratio of 7:1 maximum to minimum spindle speed.

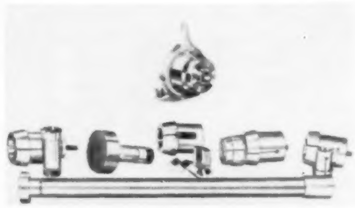
Multiple feeds and rapid approaches are available through the use of special feed dogs.

Secrest Machine Co., 1507 M. St., N. W., Washington 5, D. C. **T-4-30**

Spindle and Collet Adapters

Spindle capacity up to 2⅛ in. is possible for taper spindle lathes, using adapters in sizes L-00, L-0 and L-1 with Model B 2-in. collet chucks.

All collet adaptions including 5-C collets, 5-C pot chucks, Warner & Swasey #3 pads, expanding internal plugs and Hall Models A and B collets,

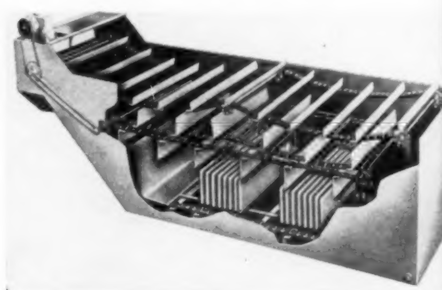


can now be used with all Hall collet chucks. When the 5-C, 5-C pot chucks or expanding plugs are used in the collet chucks, there is no lateral movement. The collet adaptions come with an adjustable stop. Where 5-C collet adaption cannot be used, the tube is employed.

Hall Mfg. Co., 622 Tularosa Dr., Los Angeles 26, Calif. **T-4-31**

Self Cleaning Filter

Use of leaf type design filter elements provides unusually large filter surface area in the dual manifold filter and al-



lows flexibility of the filter media.

As the elements are backwashed for cleaning, the pulsing action flexes sufficiently to loosen adhering particles and facilitate cleaning action.

The dual manifold principle permits a reduced filter unit size with automatic

self cleaning, opposite cycling of the manifolds. While one manifold filters, the other is being backwashed for cleaning.

The unit illustrated shows an additional set of skimmer flights for removal of foam created by extremely fine particle suspension.

Automatic control panel permits a wide latitude in all filter operations. All controls can be varied in their adjustments to allow for accurate and practical filter performance. Units are available in flow capacities from 5 to 1000 gpm on water. Higher capacity flows are handled by using multiple units.

Industrial Filtration Co., Dept. CF-298, Lebanon, Ind. **T-4-32**

Toolbits

Cast-alloy tool bit makes use of characteristics of a recently developed formula called Hardsteel HD-27M. Complex oxide additives result in high tensile strength and toughness, high red hardness, edge strength, and low coefficient of friction. Cutting tools made of the alloy will take deep cuts at high speeds with heavy feeds. Performance is consistent and economical with low tool wear with long periods between grinds.

Hardsteel HD-27M tool bits are available in square and rectangular standard sizes.

Black Drill Co., 1414 E. 222nd St., Cleveland 17, Ohio. **T-4-33**

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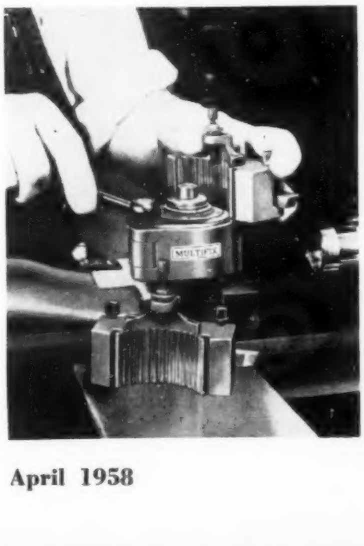
Quick Clamping Toolholder

The Multifix quick clamping toolholder allows the setting of a cutting tool at any clearance angle. Correct height of the cutting edge is easily and quickly adjusted, and cutting edge may be ground or cleaned without altering adjustment.



Changing tools is fast because the toolholder can be lifted upward without moving the lathe carriage. Tools may be clamped in 40 different positions and successive operations are unlimited. For mass production work, spare tools can be prepared in advance by grinding to a pattern and then dropping them into position in the toolholder one after the other.

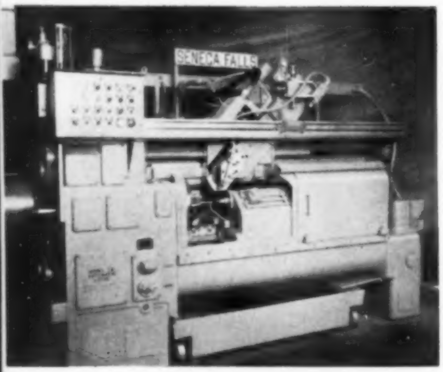
For drilling and reaming, the Swiss-made Multifix permits the use of large, long boring bars, and also allows automatic feeding. Short or long cutters may be used.

Distributed by G. and D. Sales Co., Dillverville Rd., Lancaster, Pa. **T-4-34**

Automatic Lathes

Automatic Models LQ and AQ tracer lathes for rough and finish turning shafts, combine multiple tooling for rapid stock removal and single tool tracer turning for accurate finishing operations. The operator loads shaft between centers and pushes the starting button. Multiple tools turn, then retract, after which the tracer tool finish turns and retracts to the starting position, and the machine is ready for reloading.

Multiple tools mounted on a rear carriage accomplish the roughing operation while finish turning is done with single, tracer controlled tool on one or more overhead carriages. Since the



pressure of the single, tracer controlled tool is constant over the entire length of the workpiece, it holds close tolerances and allows the cutting speeds possible with carbide and oxide tool materials. Automatic loading and transfer equipment may be used with the lathes.

The electro-mechanical tracer unit on Q model lathes responds rapidly and with precise fidelity to dimensional changes in the template. Idle time is minimized by forward and reverse rapid traverse with tracer slide. Rapid traverse movement is independent of the tracer system and is automatically operated by electric clutches through contactors mounted on the control drum.

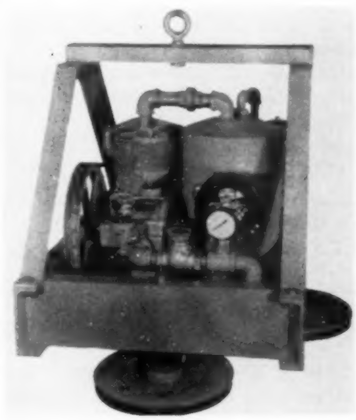
Carriages are available in five combinations. Both models LQ and AQ are designed for simplified changeover. Feed rate may be changed automatically during cutting cycle. Chip disposal may be handled by any one of three methods. The lathes are designed for efficient chip guarding and all templates are clear of chip areas. Open front design facilitates manual or automatic loading and unloading.

Tool adjustment is rapid. Rigid base machine design insures accuracy under heavy stresses of high-speed turning and multiple-carbide tool cutting. Convenient control stops permit quick synchronization of all longitudinal and cross feed movements, as well as the rapid traverse of carriages and cross slides.

The Seneca Falls Machine Co., 10 Fyfe Bldg., Seneca Falls, N. Y. **T-4-35**

Vacuum Lift

Flat material such as glass, sheet metal, aluminum sheets, marble slabs, plasterboard or plywood can be moved quickly and safely by a self-contained portable vacuum lift. The unit, which measures only 2 ft 10 in. x 3 x 4 ft long, is designed for use with an overhead crane. A standard setup with 4 vacuum



pads 12 in. in diameter can lift 4420 lb at 20 in. Hg vacuum.

A vacuum reservoir tank assures extra vacuum to maintain the system until the lift and transfer are completed in the event of mechanical failure. A built-in warning light indicates that sufficient vacuum is in the system.

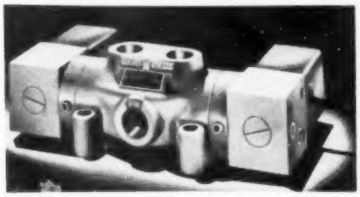
Edward Zibell Co., Montvale, N. J. **T-4-36**

Hydraulic Valves

Different methods of actuation are used on each of the six basic models in a line of directional control valves for hydraulic oil systems. The methods include lever, stem, cam, air pilot, oil pilot and solenoid actuation. There are three standard spool styles, and five al-

ternate spool styles for special circuit requirements. Most models are available with a choice of four different spool actions—spring centering, spring offset and two types of no spring.

All models have interchangeable mounting dimensions. The valves are suitable for systems up to 3000 psi, and



tested at 150 percent of their rated capacity.

Two pipe sizes are available—½ in. for 12 gpm flow, and ¾ in. for 18 gpm flow. Dry-seal pipe threads are standard on all models, and a gage port for testing is provided.

The Dukes Co., Inc., 3999 N. 25th Ave., Schiller Park, Ill. **T-4-37**

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Arc Welder

This industrial a-c transformer type arc welder incorporates "Diverter Path" control for adjustment of welding current. It provides five steps of coarse

adjustment (range settings 1-2-3-4-5), with a rheostat for fine adjustment in each range. Extra secondary winding supplies current to control rectifier—35 volts d-c for safe, low voltage remote control. No high voltage appears across any control coils, thus there is no possibility of insulation breakdown or high voltage appearing under the rheostat handle. There are no moving parts: core and coils are anchored in place for quiet operation and less maintenance.

Model TD-316-S is rated 300 amp at 40 v a-c with a welding range of 35 to 375 amp. Model TD-416-S is rated 400 amp at 40 v a-c with a welding range of 35 to 500 amp. Model TD-516-S is rated 500 amp at 40 v a-c with a welding range of 35 to 625 amp.

Hobart Brothers Co., Troy, Ohio. **T-4-38**

Tapping Machine

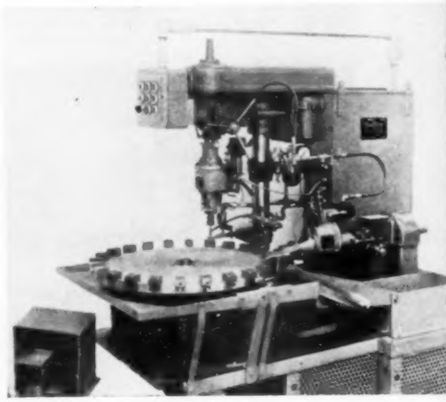
Automatic, high-speed lead screw tapping head, called the Auto-Tap, can be utilized with other standard components to meet special requirements.

The illustrated automatic, two-position tapping machine with indexing table consists of a Geneva motion index table, two standard shop drill presses and two Auto-Taps Model No. 800-A automatic tapping heads. Parts are indexed to position where the heads are

activated.

Other parts also can be tapped by the machine if proper part-holding fixtures are mounted on index plate.

A foot switch controls the operation. When the foot switch is released, the



complete unit stops. This special machine is said to have a production capacity of 35 parts per minute.

Automatic Methods, Inc., 847 W. Grand St., Elizabeth, N. J. **T-4-39**

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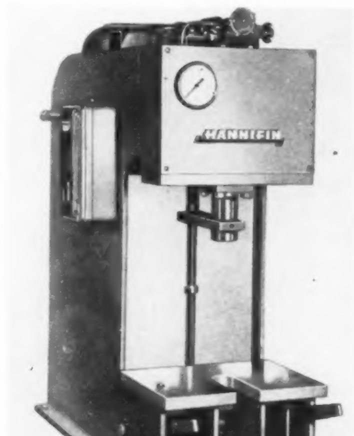
Bench Press

Dual hand control and adjustable down-stroke control are standard on this high-speed bench press for forming,



trimming and force-fit assembly operations. Electric push button controls, with or without pressure reversal, are available as optional features. Return stroke is adjustable in all models, which permits shortening the work cycle so that the ram just clears the workpiece

on repetitive operations. Tonnage is adjustable from 10 percent of capacity to full, rated capacity.

Stroke of the press is 6 in.; reach from throat of frame to centerline of ram is 6 in.; and gap is 12 in. The removable table is $14\frac{1}{2}$ in. wide x 10 in. deep, and its top is $8\frac{1}{4}$ in. above the mounting surface. The 4-ton model has the following speeds: down, advance, 700 ipm; down, feed, 330 ipm; return, 670 ipm. A 2-ton model, with the same frame, motor and pump is faster.

A matching steel base is available if the press is to be floor mounted.

Hannifin Co., Div. of Parker-Hannifin Corp., Des Plaines, Ill. **T-4-40**

Self-Aligning Contact Wheel

The R-57 contact wheel has a self-aligning rubber molded arbor hub. The wheel aligns by centrifugal force, does not vibrate, and needs no align-

ing even when spindles are worn. Speed automatically centers the wheel as it gains momentum. The rubber hub gives the R-57 wheel the effect of floating power on rubber mountings.

The rubber contact wheel for grinding and finishing operations is available in 6 to 16-in. diameters and 1 to 4-in. widths.

Chicago Rubber Co., Inc., Waukegan, Ill. **T-4-41**

Honing Machine

A Red Ring internal gear tooth honing machine, called Model GHC, performs hard gear finishing operations on spur and helical internal gears. Both taper and crown honing operations can be performed.

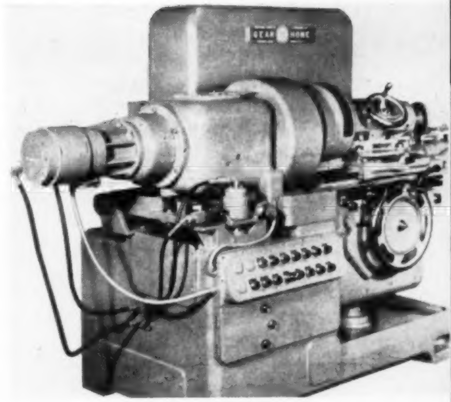
A high-speed motorized workhead with a special tilting arrangement permits honing with either constant-pressure or zero-backlash methods.

The abrasive-impregnated, gear-shaped, plastic honing tool is driven by the workgear. A handwheel adjusts the honing head to correct center distance position.

The zero-backlash method is used for removing nicks and burrs, making minor tooth-shape correction and improving surface finish of gear teeth made within commercial tolerance specifications. The constant-pressure method is used to hone teeth on gears produced to dimensions outside commercial tolerance ranges.

The workhead can be angularly adjusted to fixed positions in the horizontal plane to provide for taper honing operations.

Model GHC Red Ring internal gear tooth honing machine will hone gears from 4 to 6-in. pitch diameter. Electrical and pneumatic controls are housed in separate panel enclosures at the rear



of the machine. The workhead is driven by a 2-hp motor and the hone head is reciprocated by a $\frac{1}{2}$-hp motor. An air cylinder advances and retracts the honing head for loading clearance. Push-button controls are provided for the set-up, method selection and automatic cycle operation.

National Broach & Machine Co., 5600 St. Jean Ave., Detroit 13, Mich. **T-4-42**

USE READER SERVICE CARD ON PAGE 267 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

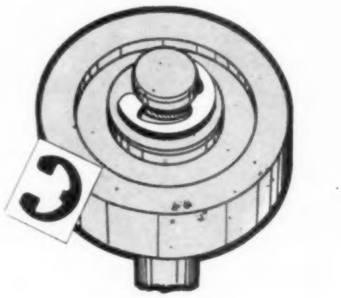
Reinforced E-Rings

Radially-installed reinforced E-rings, Series 5144, provide approximately five times greater gripping strength and 50 percent higher rpm limits than conventional E-type fasteners. In the $\frac{1}{4}$-in. size, for example, the safe limit is 38,000 rpm as compared with 25,000 rpm for conventional E-rings.

The fastener is particularly suitable for assemblies in which the ring is subject to strong push-out forces resulting from heavy vibration and shock loads, high rotational speeds or relative rotation between the retained parts. It may be used with abutting retained parts having large corner radii or chamfers.

In the Series 5144 a heavy web section with tapered bending arms develops unusually strong spring pressure with no increase in permanent set. To further increase the ring's gripping power, the entrance gap has been narrowed and the inside of the lugs made parallel at the gap.

The fastener is manufactured in sizes to accommodate shafts ranging in di-



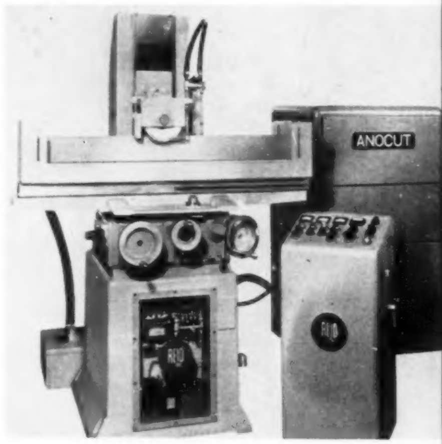
ameter from $\frac{3}{32}$ to $\frac{7}{16}$ in. Ring dimensions permit substitution for conventional E-rings in most applications.

Standard material is carbon spring steel (SAE 1065-1090); standard finish is oil-dipped. Other materials and finishes are available.

Waldes Kohinoor, Inc., 47-16 Austel Pl., Long Island City 1, N. Y. **T-4-43**

Electrolytic Grinder

Although utilizing the basic Anocut 300-amp unit as its electrolytic power supply, the Model 618 electrolytic



grinder is designed to get optimum stock removal with good operation and convenience of control.

The motor is $1\frac{1}{2}$ hp shell type design. A 20:1 adjustable d-c drive provides smooth, yet slow table speeds between $\frac{1}{2}$ and 11 ipm. Drive is poten-

tiometer controlled as far as speed is concerned, to give immediate and sensitive adjustment when desired.

Control panel on the console model control unit has both the Anocut grinder control units.

An ammeter in the spindle circuit keeps constant check on the spindle load. Isolation transformers for the spindle provide safety to the operator from electrical discharge. An emergency stop can be operated manually; if the spindle develops an overload condition, the entire operation is automatically stopped.

A flow coolant system supplies a solution of electrolytic salts and water to the wheel.

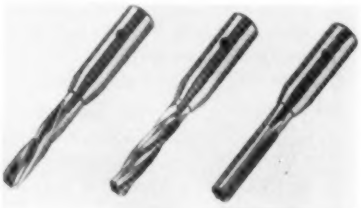
It is possible to convert from electrolytic grinding to standard grinding, or back to electrolytic grinding in only a few seconds. Hand operation of the table is gained by merely engaging or disengaging the drive with a convenient shifting clutch.

Reid Bros. Co., Inc., Beverly, Mass.

T-4-44

Carbide Reamers

Solid carbide reamer portion of these stub screw machine reamers is brazed into a hardened and ground steel shank. The tools are available in sizes of 0.060 and 0.510. Reamer diameters of 0.060



to 0.115, inclusive, have a 45-deg cutting chamfer; those from 0.1151 to 0.510, inclusive, have a standard radius chamfer.

Rotary Tool Industries, Inc., Dept. TE, 4461 W. Jefferson, Detroit 9, Mich.

T-4-45

Machine Protection Device

An instantaneous jam protection panel, called the I.J.P., is used for conveyors, machine tools, automation equipment and other industrial powered machinery.

When jam occurs on multiple drives, power is automatically locked out until jam is cleared. Operating cycle of the panel is a fraction of a second. Pressing a button resets protection device. A red light indicates the overloaded motor and helps to locate the jam. The panel is easily adjusted for various loads and conditions, and is simple to

install because it is prewired. Three-phase power is hooked up to panel, and motor leads run out to individual drive motors.

Two models, with or without starting switch are available. Panel with starter measures 30 in. high x 20 in. wide x 7¼ in. deep. Panel without starter measures 14 in. x 16¼ in. x 6¼ in.

Palmer-Bee Co., Bloomfield Hills, Mich. **T-4-46**

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Expanding Collets

Many machining operations can be completed in one chucking through use of expanding collets.

Exact concentricity of the expanding collet unit makes it easy to obtain concentric and square shoulders, faces, and

diameters from a previously machined bore. Because the back stop is machined in place and is a dead stop, there is no need for special shouldered expanding collets. Neither the stationary expanding collet nor work locating stop have any end movement.

Hardinge Brothers, Inc., Elmira, N. Y. **T-4-47**

Numerically Controlled Milling Machines

Designed particularly for three dimensional milling of small and medium sized workpieces of ferrous and nonferrous metals, three standard knee type vertical milling machines are available for numerically controlled operation.

The three KTNC models include the 5-hp Model 2CH-KTNC with 16 spindle speeds ranging from 25 to 1500 rpm, and two heavy-duty 15-hp models, the 315TF-KTNC and the 415-TF-KTNC, each with twin elevating screws and 24 spindle speeds ranging from 15 to 1500 rpm.

Power for short feed motions is transmitted through low-friction, re-circulating ball screws.

Three control systems are available: Bendix, GE, and ECS—Digimatic. Proper selection of a particular control system is determined by the specific job,

The 2CH-KTNC with ECS-Digimatic control system.

price and computer facilities available. Any one of the systems can be applied to any of the three machine models.

Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee, Wis.
T-4-48

Cobalt High-Speed Drills

Special cobalt high-speed steel drills are designed for those drilling applications which are considered impossible for conventional high-speed drills due to annealing caused by heating.

Applications of the Super Cobalt drills are for drilling work-hardened stainless steels, hardened laminated safe steels, silcon chrome and certain

chrome nickel alloy steels, and armor plate acid resistant castings and forgings.

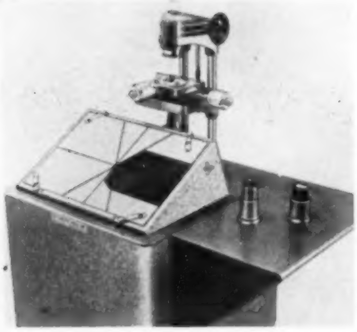
The drills are available with taper shanks in fractional sizes and in jobbers, letter and wire gage sizes. A bonding bit also is made for drilling rail bond heads.

Chicago-Latrobe, 411 W. Ontario St., Chicago 10, Ill.
T-4-49

Optical Projector

Floor Model A-f Micro-Projector is a self-contained, self-supporting unit for use alongside machine tools or wherever space is limited.

The model is available in six selective magnifications and with a choice of three different measuring stages, cen-



ters, surface illumination, protractor as well as measuring screens.

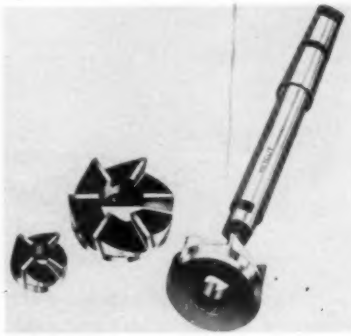
Opto-Metric Tools, Inc., 137 Varick St., New York 13, N. Y. **T-4-50**

Back Spotfacers

Line of back spotfacers that will successfully spotface and counterbore inside surfaces, are designed with a positive rake angle to reduce excessive heat. Heat is further reduced by a back-taper on the outside diameter which minimizes OD wear due to friction and abrasive action. Ground radial relief on the outside diameter of the flutes minimizes galling of the cutter and stops the tendency of the tool to push away from the work. The tool is thus able to cut freely, even on the side of a filet or web wall.

Cutters with ¾-in. drive hole and over (approximately 1½ in. diameter) are designed with six flutes instead of four. This helps reduce tool chatter and assures smoother cuts on rough surfaces. Parallel drive lugs on the cutter, with corresponding drive slots on the pilot, help keep the tool on-center. All sizes have adequate flute depth which facilitates chip handling and disposal.

The back spotfacers are available in 33 standard sizes from ½ to 2¾ in.



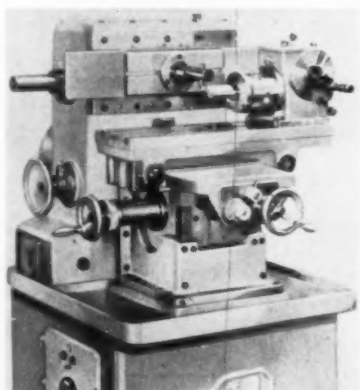
OD. Drivers with Morse taper shank, range from 5/16 to 1⅝ in. OD and from 2½ to 5 in. long. They are also made special in many cutting shapes, combining spotfacing, chamfering, counterboring or other special operations.

Metal Cutting Tools, Inc., 301 S. Water St., Rockford, Ill. **T-4-51**

USE READER SERVICE CARD ON PAGE 267 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Universal Shaper

The K-15 form and punch shaper is equipped to produce contours of all kinds, surfaces and punches with curved necks. Parts are turned to tolerance of ±0.00025 in. The shaper offers speeds



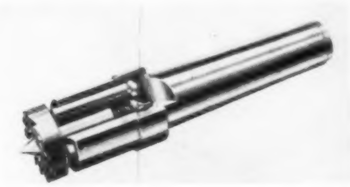
of 50, 75 and 110 strokes per minute; a working area up to 6 x $6\frac{1}{4}$ in.; stroke of 0 to 6 in. punch shaping, maximum length to beginning of radius $4\frac{3}{4}$ in. With the ability to turn out precise irregular-shaped stamping and electrode punches, this shaper employs a large dividing head with automatic circular feed that permits machining of radii and angles automatically.

All controls and operational parts are incorporated into the compact machine and completely encased. Additional attachments and clamping devices permit machining the entire surface of workpiece without need for reclamping. A built-in 30-power microscope for high precision punches permits inspection while part is being machined.

Jersey Mfg. Co., 455 Livingston St., Elizabeth, N. J. **T-4-52**

Driving Centers

With this driving center designed to eliminate the use of a driving dog, machines need not be stopped between workpieces. The components are available from stock with Nos. 2, 3, 4, 5, 6



Morse Taper shanks. Each driving center is supplied complete with three interchangeable driving plates to hold workpieces from $\frac{9}{16}$-in. diam and up.

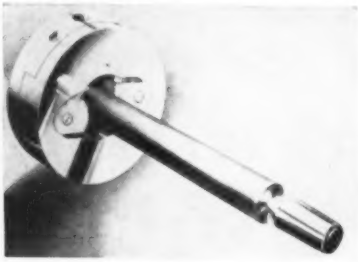
R. B. Tool Co., Inc., 785 N. Broadway, White Plains, N. Y. **T-4-53**

Work Driver

Serrated jaws milled on an angle allow this work driver to grip work positively. It may be used on any type machine carrying work on centers that require a means of rotation.

The self-centering, quick acting and positive tool is designed to eliminate dogging time and to increase productivity by permitting an operator to handle two or more machines.

Angular serrations of the jaws provide overlapping contact and positive quick grip on both smooth finish and hot rolled stock and on forgings having a relatively hard surface. Design permits the jaws to tighten automatically in relation to the depth of cut, and the harder the pull the tighter the grip. The serrated feature also prevents tool chatter on head center because of a balanced and guided jaw



slide which is free to adjust itself to reasonable eccentricity between center and outside diameter.

There are no sharp projecting screws or sharp corners to harm clothing or hands.

Work Driver bodies are made in two types: adapter plate type which has a recessed back and is mounted on a spindle by means of an adapter or chuck plate; and direct mounting type for mounting on American standard type A-2 spindle noses. Automatic driver slides are made in four different types with several capacities. Special slides can also be furnished for machine spindles having clockwise rotation. Driver jaws are made from hardened alloy steel. Jaws are available with either coarse or fine serration. The work driver is available in 18 standard sizes with work diameters from $\frac{1}{4}$ to $6\frac{7}{8}$ in.

Seneca Falls Machine Co., 11 Fyfe Bldg., Seneca Falls, N. Y. **T-4-54**

Coolant Unit

A large-capacity, high-pressure coolant unit for use in gun drilling operations is available in both 40 and 60 gpm models. Installation of the unit permits use of gun drills on virtually any turning machine for deep, precision drilling in one pass from the solid at high rate of feed.

Standard features include three-stage filtration with 40-micron filters, plus a

heat exchanger with water regulator for minimum water consumption. A totally enclosed motor provides power for rated pressure and volume. Pressure is adjustable from 0 to 750 psi.

Optional features include replaceable cartridge type 5-micron filtration, sump type screen filter and 3-ton cooling capacity refrigeration.

Madison Industries, Inc., Muskegon, Mich. **T-4-55**

Wire Forming Machines

Model 00 automatic 4-slide wire forming machines incorporate a "flip top" vertical swing bed which permits raising the machine to vertical positions for tooling, adjustment and maintenance. When in operation, the tool is used in the horizontal position.

The machines provide feed length up

THE TOOL ENGINEER'S *Service Bureau*

TRADE LITERATURE CURRENTLY OFFERED BY THE TOOL ENGINEER ADVERTISERS

A-4-238—Bushings—*Accurate Bushing Co.* Catalog and price list describes complete line of standard bushings and parts. (Page 238)

A-4-422—Die Sets—*Acme-Danneman Co., Inc.* Catalog includes listings of standard die sets, bushings and accessories. (Page 422)

A-4-467-3—Power Feed Attachment—*Acme Industrial Co.* New literature describes power drive to convert hand-operated turret lathe to automatic. (Page 467)

A-4-385—Cutting Tools—*Adamas Carbide Corp.* Dex-A-Tool Carbide Insert described in free copy of "Throwaway Tooling Set-up and Follow Thru." (Page 385)

A-4-380-1—Filter Regulator Units—*Air-Mite.* Catalog sheets describe new filters, lubricators, and regulators. (Page 380)

A-4-254—Drill Grinders—*Alina Corp.* Illustrated literature describes new machine for grinding drills and cutting tools. (Page 254)

A-4-38—Die Steels—*Allegheny Ludlum Steel Corp.* Four-page folder describes handling and shop treatment details on Ottawa 60 type steel. (Page 38)

A-4-353—Socket Screws—*Allen Mfg. Co.* One-hundred-twelve page vest-pocket size Hex-Socket Screw Handbook gives technical information. (Page 353)

A-4-245—Filtration System—*Alsop Engineering Corp.* Engineering bulletin describes sub-micron filtration coolants and oils. (Page 245)

A-4-17—Drill Bushings—*American Drill Bushing Co.* Free copy of new catalog describes standard drill bushings. (Page 17)

A-4-16—Lathes—*The American Tool Works Co.* All the facts on "American" Pacemaker Lathes are described in Bulletin No. 150. (Page 16)

A-4-261—Cutting Fluid—*Anderson Oil and Chemical Co., Inc.* Descriptive literature on Shamrock, a water-soluble chemical emulsion for cooling and lubricating, is available. (Page 261)

A-4-301—Saws—*Armstrong-Blum Mfg. Co.* No. 8 Marvel sawing machine described in new catalog. (Page 301)

A-4-366—Drill Units—*Aro Air Tools.* New literature describes complete line of air-operated drill units for automatic drilling. (Page 366)

A-4-408-1—Vibratory Feeders—*Automation Devices Inc.* Peeco vibratory parts feeders described in new literature on latest feeding techniques. (Page 408)

A-4-420-1—Drilling Unit—*Bedford Gear & Machine Products, Inc.* Free catalog and data sheet describe use of Bedford gears Hydroscape automatic drilling unit. (Page 420)

A-4-425—Air Motors—*The Bellows Co.* New file of cost-cutting ideas by other companies has been developed and is now available. (Page 425)

A-4-482—Collets—*Benco Collet Mfg. Co.* Most sizes of solid and master pushers, solid and master collets for automatics are described in price list and catalog. (Page 482)

A-4-18—Grinding Wheels—*The Blanchard Machine Co.* Two booklets, "Blanchard Abrasive Wheels and Segments," and "The Art of Blanchard Surface Grinding" (3rd edition) are now available. (Page 18)

A-4-347—Sprockets and Chains—*Boston Gear Works.* All the new types and sizes of sprockets and chains in the Boston Gear line are listed in Catalog SC-3. (Page 347)

A-4-394-1—Power Screwdriver—*The Bristol Co., Socket Screw Div.* Complete data available on new production tool for automatically inserting socket set screws. (Page 394)

A-4-445—Optical Tooling—*Charles Bruning Co., Inc.* Free booklet describes Bruning-Brunson optical tooling—principles, applications and equipment. (Page 445)

A-4-361—Machine Tools—*The Bullard Co.* Representatives are available to discuss machine rebuilding. (Page 361)

A-4-453—Radial Drills—*The Carlton Machine Tool Co.* Free descriptive bulletins are on programming, preselection, speed-feed controls, plus general equipment for radial drills. (Page 453)

A-4-394-2—Inspection Equipment—*Carr Lane Mfg. Co.* Catalog 5 describes complete line of construction balls, pads and covers. (Page 394)

A-4-380-2—Protective Coverings—*Central Safety Equipment Co.* Bulletin 57 contains complete data on Elasticone snap-over covers for exposed pins and shafts, to guard them against damage. (Page 380)

A-4-337—Air Tools—*Chicago Pneumatic Tool Co.* Case histories using Magnamatic tool described in free booklet SP-3165 and information in Bulletin SP-3126. (Pages 336-337)

A-4-313—Rivets—*Chicago Rivet & Machine Co.* New rivet catalog describes 1388 standard tubular and split rivets in 26 single and multiple automatic rivet setters. (Page 313)

A-4-444—Press Brake—*Cincinnati Shaper Co.* Full details about the Cincinnati Autocycle press brake described in Bulletin B-9. (Page 444)

A-4-327—Presses—*Clearing Machine Corporation, Div. of U.S. Industries, Inc.* Bulletins, catalogs and movies on presses and press operation are available. (Pages 326-327)

A-4-296—Optical Grinder—*The Cleveland Grinding Machine Co.* Free brochure describes the capabilities of the visual grinding machine for contour precsion grinder. (Page 296)

A-4-297—Tool and Die Making—*Cleveland Tool and Die Co.* Free brochure describes the facilities of Cleveland Tool & Die Co. (Page 297)

A-4-442-3—Tapper—*Commander Mfg. Co.* Illustrated circular and name of the nearest distributor available on Commander Lead-Matic Tapper. (Page 442)

A-4-226—Carbide Tools—*Arthur A. Crafts Co., Inc.* Free catalog "Complete Carbide Tooling for Automatics" describes carbide and diamond tools and gages. (Page 226)

A-4-394-3—Die Cushions—*Dayton Rogers Mfg. Co.* Free catalog available on die cushions. (Page 394)

A-4-406—Mold Bases—*Detroit Mold Engineering Co.* Complete mold bases and accessories described in 170-page catalog. (Page 406)

A-4-262-2—Plastic Steel—*Devcon Corp.* Free catalog describes uses in industry for repairing castings and worn parts. (Page 262)

A-4-429—Portable Machines—*The Dumore Co.* Details of the Versa-Mil portable precision machine described in free bulletin. (Page 429)

A-4-294-1—Thread Standards—*The Eastern Machine Screw Co.* Free booklet "Unified and American Screw Thread Digest" outlines the latest standards. (Page 294)

A-4-35—Projectors—*Eastman Kodak Co.* New, illustrated booklet, "Kodak Contour Projectors," gives details on production uses of projection equipment. (Page 35)

A-4-323—Engineering and Designing—*Ehrhardt Tool and Machine Co.* Facilities available at Ehrhardt in illustrated 24-page brochure. (Page 323)

A-4-67—Electro Discharge—*Elox Corp. of Michigan.* Details on EDM machining of cavity type dies discussed in Bulletin P-7-1257. (Page 67)

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A-4-398—Expanding Mandrels—*Erickson Tool Co.* Catalog K on Erickson precision tools describes how precision expanding mandrels speed production and cut costs of machining. (Page 398)

A-4-28—Drilling and Tapping Machines—*The Foote-Burt Co.* Circular No. 7A describes uses of Hammond radial drilling and tapping machines. (Page 28)

A-4-338-3—Carbide Cutters—*M. A. Ford Mfg. Co., Inc.* Information on production burring cutters available in Catalog 601. (Page 338)

A-4-249-1—Optical Tooling—*The Gaertner Scientific Corp.* Bulletins 188-53 and 194-57 describe the new Gaertner coordinate Cathetometers. (Page 249)

A-4-431—Valves and Cylinders—*Galland-Henning Nopak Div.* Nopak square-head hydraulic cylinders are discussed in Catalog 103. (Page 431)

A-4-17—Turret Lathe—*Gisholt Machine Co.* Fastermatic Catalog 1179-B describes uses, application of this equipment. (Page 17)

A-4-19—Ram Type Turret Lathe—*Gisholt Machine Co.* New Catalog 1182-A describes ram type turret lathes with hydraulic drive and application to automated production. (Page 19)

A-4-20—Superfinisher—*Gisholt Machine Co.* Superfinishing opposing faces in one operation described in Catalog 1169-B. (Page 20)

A-4-20C—Chucking Machines—*Gisholt Machine Co.* Application of Multisurface machining in one chucking operation discussed in Simplimatic Catalog 1169-C. (Page 20)

A-4-71—Diamond Tools—*Golconda Corp.* Free illustrated brochure discusses new Orvec diamond tools. (Page 71)

A-4-376—Milling Machine—*George Gorton Machine Co.* Gorton Mastermil details described in Bulletin 2699-2604. (Page 376)

A-4-432—Brazing-Alloys—*Handy & Harman.* Values, techniques and economies of low-temperature silver brazing discussed in Bulletin 20. (Page 432)

A-4-346—Air Valves—*Hannifin Co.* Complete catalog showing all Hannifin directional air-control valves available. (Page 346)

A-4-363—Drilling and Tapping Machines—*The Hartford Special Machine Co.* Complete information on Model 10-210 machine and other machine components available. (Page 363)

A-4-310—Air Vise—*Heinrich Tools, Inc.* Free catalog describes line of Heinrich air vises and clamps. (Page 310)

A-4-66—Milling Cutters—*Cutter Div., The Ingersoll Milling Machine Co.* Complete line of Ingersoll inserted blade milling and boring tools described in Catalog No. 66-F. (Page 66)

A-4-227—Progressive Dies—*The B. Jahn Mfg. Co.* Twenty-page case history brochure on B. Jahn-built progressive dies now available. (Page 227)

A-4-251—Taps—*Jarvis Corp.* Tap catalog lists all standard tap sizes and styles, plus complete tap data and tips for better tapping. (Page 251)

A-4-408-4—Surface Hardening—*Kasenit Co.* Free descriptive booklet discusses Kasenit surface hardening compound for tools. (Page 408)

A-4-63—Loading Table—*Albert Klingelhofer Machine Tool Corp.* Illustrated literature available on new automatic loading table for Wagner WKA-200 cold saw. (Pages 62-63)

A-4-8—Welders—*The Lincoln Electric Co.* Specifications and engineering data on Shield-Arc motor-generator welders are contained in Bulletin SB-1362. (Page 8)

A-4-314—Reamers—*McCrosky Tool Corp.* Full details on adjustable reamers are described in Bulletin 19-R. (Page 314)

A-4-39—Feeds—*The McKay Machine Co.* Free booklet lists complete illustrated data on McKay press feeds and cut-up equipment. (Page 39)

A-4-304—End Mills—*Melin Tool Co., Inc.* New Melin tool catalog No. 54-C lists the specifications on stub length tools. (Page 304)

A-4-430-3—Special Cutters—*W. F. Meyers Co., Inc.* Bulletin No. 52 describes advantages of made-to-order cutters at stock cutter prices. (Page 430)

A-4-19—Circular Sawing—*Motch & Merryweather, Cutting Tool Mfg. Div.* Free copy of M & M's circular sawing handbook, a pocket-sized guide to sawing operations is available. (Page 19)

A-4-371—Gear Honing—*National Broach & Machine Co.* Bulletin H57-2 gives information on Red Ring hard gear honing. (Page 371)

A-4-282—Valves—*C. A. Norgren Co.* No. 900 catalog describes complete line of fluid control valves. (Page 282)

A-4-358-3—Jig and Fixture Components—*Northwestern.* New 16-page catalog and tracing templates for jig and fixture components and clamping tools is now available. (Page 358)

A-4-305—Metal Cleaning—*Oakite Products, Inc.* Free copy now available of "Some Good Things to Know about Metal Cleaning." (Page 305)

A-4-72—Induction Heating—*The Ohio Crankshaft Co.* Free booklet describes "Typical results of Tocco induction heating." (Page 72)

A-4-316—Contour Machining—*The Olofsson Corp.* Facts and specifications are on Model 30-008 cam-operated precision contour machine described in new bulletin. (Page 316)

A-4-420-3—Balancing Machines—*Tinius Olsen Testing Machine Co.* Bulletin 56 describes high-speed Rava electrodynamic balancing machines. (Page 420)

A-4-286—Air Grinder—*Onsrud Machine Works, Inc., Portable Tool Div.* Air turbine grinders described in Bulletin DI-GB. (Page 286)

A-4-438-2 — Comparator — *Opto-Metric Tools, Inc.* Free booklet describes Wilder small parts comparator in gage "Deep-Etch" comparator charts. (Page 438)

A-4-262-1 — Cylinders — *Ortman-Miller Machine Co.* Bulletins 101A on internal keytype air and hydraulic cylinders, and 105 on heavy-duty hydraulic cylinders now available. (Page 262)

A-4-350-2—Height Gage—*Pacific Gage, Inc.* Free literature and price list available on multipurpose height master tools. (Page 350)

A-4-434—Press Brakes—*Pacific Industrial Mfg. Co.* Illustrated brochure contains complete details on Pacific hydraulic press brakes. (Page 434)

A-4-281—Dial Indicators—*Petz-Emery, Inc.* Complete line of dial indicators described in literature D. (Page 281)

A-4-441—Production Bending—*Pines Engineering Co., Inc.* Free copies of "Pines News" gives complete data on new production bending applications. (Page 441)

A-4-464—Aluminum—*Pioneer Aluminum Inc.* Free issues of TOOL TALK, presents new and unusual applications of Pioneer 921-T aluminum tooling plate. (Page 464)

A-4-414-3—Boring Tools—*Precision Tool & Mfg. Co. of Illinois.* Catalog describes Deka Bore boring heads and bars. (Page 414)

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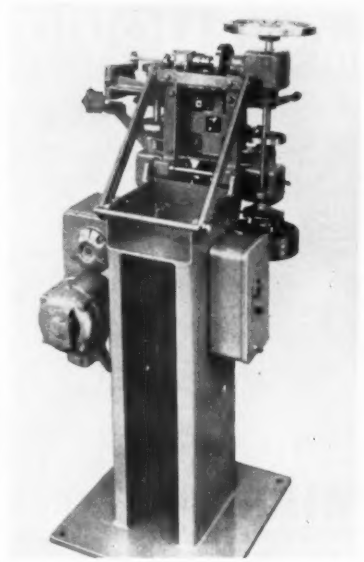

to $4\frac{1}{4}$ in., with ample tooling areas at each position.

A new pedestal base, which requires less than $2\frac{1}{2} \times 2\frac{1}{2}$ ft of floor space includes a convenient shelf under the machine.

The Baird Machine Co., Stratford, Conn. T-4-56

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Ultrasonic Cleaner

The ultrasonic cleaner, designated Ultracleaner Model 500A, can accommodate parts up to 10 in. long. The wash-

er element is 11 x 6 in. at the top and $6\frac{1}{2}$ in. deep. Construction provides an ultrasonic chamber and a rinse basin.

Design feature of the unit permits plug-in of a second ultrasonic washing tank to operate concurrently or separ-

ately, using no additional equipment. The two chambers then may be used concurrently.

Lawrence Mfg. Corp., Evans Terminal, N. Broad St., Hillside, N. J.
T-4-57

Sealess Pump

Model 5P-4521 sealess gusher pump incorporates triple discharges which may be used individually, simultaneously or in any combination.

The pump is available in two lengths, has no seals or metal-to-metal contacts. It is available with 1/10 hp, 1725 or 3450

rpm and ¼ hp, 3450 rpm motors, for heads up to 30 ft and capacities up to 30 gpm.

The Ruthman Machinery Co., Cincinnati 2, Ohio.
T-4-58

Plastic Metal

A soft, putty-like material, called Plastic Metal, can be applied with a putty knife or spatula to anything that is cracked, chipped, gouged, or otherwise damaged. At an average room temperature of 70 deg the material is said to harden to the consistency of solid steel within 30 minutes, and can then be drilled, threaded, machined, ground, sanded or feather edged as though it were metal. It bonds successfully with almost any material.

Pattern makers can use the material to "pour" models and patterns in addition to making repairs and alterations on patterns, or can make molds, jigs, forming dies, etc.

Plastic Metal has the ability to produce and retain fine details.

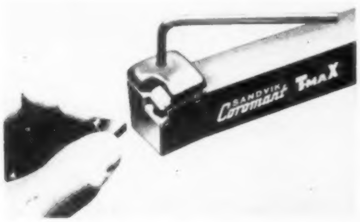
Regardless of temperature, it adheres permanently, does not dry up,

shrink or expand, does not corrode or rust, and resists most oils, chemicals and solvents. It also can be used under water.

The A. L. Okun Co., Inc. 109-02 Van Wyck Expressway, South Ozone Park, Long Island 20, N. Y. **T-4-59**

Toolholder

The T-Max throwaway type carbide toolholder incorporates a spring-loaded pin which automatically lifts and holds the chipbreaker against the clamp when insert is indexed or changed. The solid carbide chipbreaker has three fixed positions which adapt it to light, medium or heavy cuts. Because it is adjusted to suit the cut simply by pushing into position with end of wrench, the single triple-purpose chipbreaker fits all normal cuts.



Identical chipbreakers fit almost all Coromant toolholder styles.

The clamping screw operates from top or bottom with the same wrench. This offers considerable time saving on multitool setups.

A precision-located recess assures accurate seating of the insert and machining precision.

Sandvik Coromant Div. of Sandvik Steel, Inc., 1702 Nevins Rd., Fair Lawn, N. J. **T-4-60**

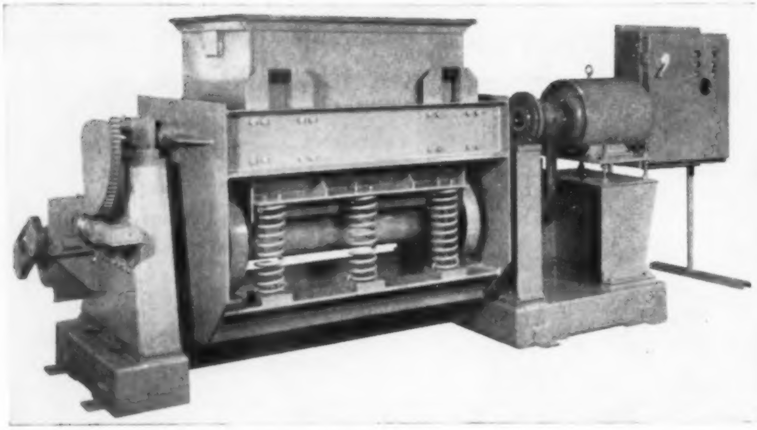
USE READER SERVICE CARD ON PAGE 267 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Finishing Machine

Equipment for descaling, deburring, grinding, fine finishing, coloring and burnishing of all metals and alloys and many plastics employs the principle of controlled vibration and permits a certain flexibility in vibrational frequencies and amplitudes. The vibrator can be supplied for either fixed or adjustable amplitudes and frequencies.

The vibrator differs from a conventional tumbling barrel in that every cubic inch of load is in continuous work motion. Also present is an effective scrubbing action which is caused by frequency and amplitude.

While small parts can be vibrated



"free," heavy parts must be racked or fixtured. When parts are fixtured in the vibrator, the time cycle is reduced by 50 percent—it can be reduced still further by securing the fixture to the rim of the vibrating bowl. Stock removal of up to 200 microinches was achieved on hard stainless-steel turbine blades in 30 minutes when such blades were suitably fixtured.

The vibrator removed a heavy flash on a die-cast part in 23 minutes. A combined descaling and cut-down operation on hand shovels was accomplished in 5 minutes, coloring or burnishing in 3 minutes.

To a certain extent, the vibrator will also work in recessed and shielded areas.

The new machine which is readily adaptable for use in automated production lines will handle extremely coarse work to very fine finishes.

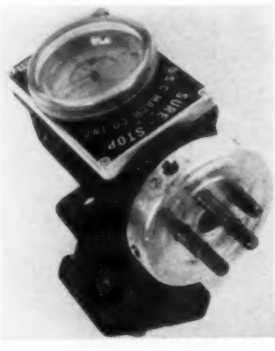
Models currently available range from 10 to 30 hp and in bowl capacity from 6.92 to 17.50 cu ft.

Lord Chemical Corp., 2068 S. Queen St., York, Pa. **T-4-61**

Lathe Indicator

In duplication of machine parts, tolerances closer than ±0.001 in. can be held on ordinary engine lathes by semi-experienced operators with the lathe indicator called Sure Stop.

The unit has five easily adjustable stop rods which index accurately to allow a wide range of machining possibilities.



Two dial indicators are available. One is graduated in 0.001 in., and the other in 0.0001 in. Movable limit stops are mounted on the indicator to enable an operator to find and duplicate his previous setting quickly.

D.S.C. Machine Co., Inc., 21 Bertel Ave., Mount Vernon, N. Y. **T-4-62**

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Diamond Collector

Designed for installation in either a central collecting system or with unit type systems, this diamond recovery unit is adaptable to mist, wick or dry diamond-wheel grinding.

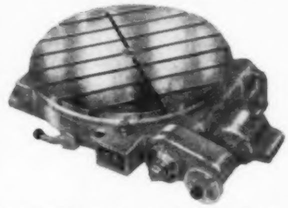
In a controlled field test an average of 30 percent of the carats originally contained in the grinding wheels was recovered from the swarf.

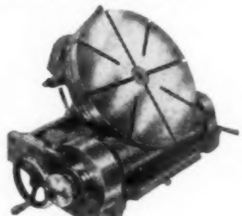
The compact diamond collector operates on a centrifugal separating principle that requires no filters, oil baths or inflammable materials.

The unit deposits the diamond-bearing dust in a clear container where it can be visually inspected. When full, the top can be unscrewed and the container easily emptied. No other maintenance is necessary.

It can be mounted directly on machinery, on walls, overhead beams or on a specially-designed table available with the collector.

Because it is impractical to reclaim diamond dust that has been contaminated with residue from other type grinding wheels, the unit is equipped with a by-pass valve. This allows grinding wheels of other types to be





used intermittently on the same grinder without danger of contaminating the collected diamond dust.

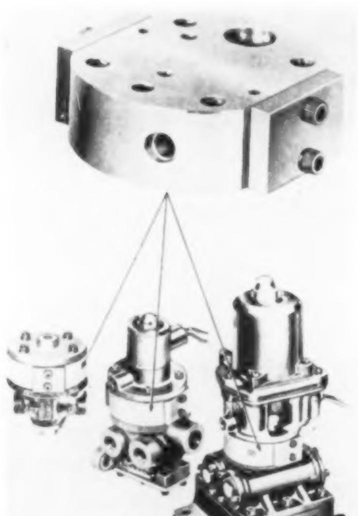
The collector is powered by a ½-hp, 3450-rpm motor, either 110V/60 cycle, 1 phase, or 220-440V/60 cycle, 3 phase and is available with other electrical characteristics.

Dept. KP-1, Torit Mfg. Co., Walnut and Exchange Sts., St. Paul 2, Minn. **T-4-63**

Air Index Adaptor

Inserted between the valve head and valve body, the double-stroke air-index adaptor converts a long-life Skyline series valve to momentary action.

Ross Operating Valve Co., Detroit, Mich. **T-4-64**



Fastening Tool

This powder-actuated fastening tool incorporates a control assembly with tapered interceptor jaws that stop an overpowered fastener (or one that encounters a soft or thin spot in the work surface) before it leaves the tool. Thus there is no damage to the tool.

The device, called Flite-Chek, is capable of sinking a fastener into as much as an inch of steel.

Arresting device in the tool is automatic and in no way slows down the tool's operation. Although it is designed for threaded studs, there is no necessity to thread the stud into or out of the piston-like flight brake device.

The tool uses ¼-in. fasteners with special plastic tips.

Ramset Fastening System, Olin Mathieson Chemical Corp., 460 Park Ave., New York 22, N. Y. **T-4-65**

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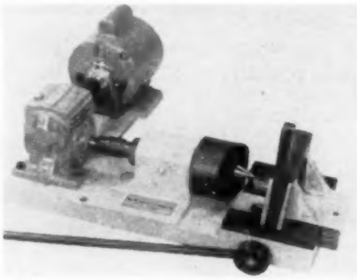
Tube Flaring Machine

The Power Flare machine flares tube-ends so smoothly that pressures up to 11,000 psi can be utilized. It is used on ¼ through 2½ in. diam steel and copper tubing for all wall thicknesses ordinarily used in hydraulic, pneumatic and fluid installations.

Units are furnished with gear reducer and standard motor conforming to J.I.C.



standards or with compact ratio motor, ⅓ hp, 110 v, 60 cycle. No special wiring is required.

Olsen Mfg. Co., 638 S. Rochester Rd., Clawson, Mich. **T-4-66**

Turning Machine

A precision radius turning machine, readily adaptable to turning small metal parts used in the instrument field, can turn concave or convex radii up to 1 in. and is provided with a longitudinal slide in addition to the slide used for turning. Thus, the tool can be fed into the work without altering the radius for

BREAK 100% INSPECTION BOTTLENECKS

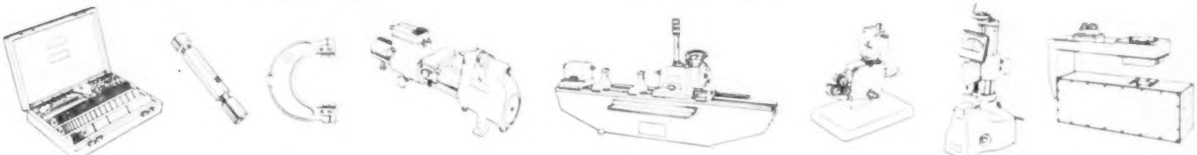
. . . WITH PRATT & WHITNEY "JOB-ENGINEERED" GAGING MACHINES

Performance levels in this space-travel era have created demands for much higher standards of precision. More and more components now require 100% inspection. In many plants, this has resulted in production bottlenecks at the inspection bench, and gaging costs have soared. Where parts must be classified for selective assembly, or where several dimensions of each part must be checked, the slow-down is intensified. Inspection costs sometimes exceed manufacturing costs.

Manufacturers are finding that Pratt & Whitney Automatic Gaging installations – like the examples above – provide the ideal solution. While each installation is job-engineered to provide the best possible gaging method, costs are kept to a minimum, because P&W Automatic Gaging Machines are assembled from standard, in-stock units. Sigmatic Gaging Machines, for example, are usually equipped with interchangeable gage tooling for fast, easy change-over from one part to another.

If the components you produce require 100% inspection, P&W Automatic Gaging can help you eliminate inspection bottlenecks and reduce gaging costs.

Send now for complete case-history reports on the 2 installations shown above and for fully descriptive product literature. Pratt & Whitney Company, Inc., 16 Charter Oak Blvd., West Hartford, Conn.



STANDARD MEASURING MACHINES . . . COMPARATORS . . . AUTOMATION AND CONTINUOUS GAGES . . . GAGE BLOCKS . . . CONVENTIONAL GAGES . . . SUPERMICROMETERS

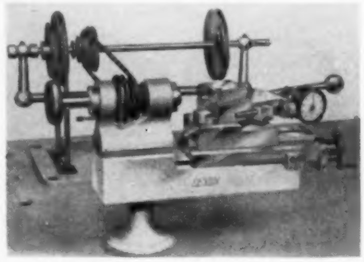
PRATT & WHITNEY

FIRST CHOICE FOR ACCURACY

MACHINE TOOLS • GAGES • CUTTING TOOLS

which it is set. Provision is made for both vertical and horizontal centering of the cutting tool. The lathe has a 2 in. travel and is provided with a friction dial graduated either in thousandths of an inch or hundredths of a millimeter.

The standard lathe head stock has a collect capacity of either $\frac{3}{16}$ or $\frac{5}{16}$ in.



A spindle 1 in. longer than standard can be furnished to provide extra clearance for the radius turning slide.

Louis Levin & Son, Inc., 3610 S. Broadway, Los Angeles 7, Calif.

T-4-67

Milling Machine

Material from large diesel engine pistons is automatically removed by this milling machine in accordance with a precision weight measurement. A

weight tolerance of ± 0.02 lb is maintained in the milled parts.

The machine is designed to handle $4\frac{3}{8}$-in. diam aluminum or cast iron pistons as well as $3\frac{5}{8}$-in. diam aluminum pistons of varying designs and weights. To ennable a milling cutter on the machine to remove metal from the cast iron and aluminum parts at

optimum surface speed, a two-speed 600 and 1800-rpm motor is provided for the spindle drive.

A built-in memory device in the electrically-controlled machine automatically sets the depth of cut of the milling cutter based on readings of the precision electronic weight scale. Overweight parts outside the blueprint specifications are automatically cancelled from the memory circuit.

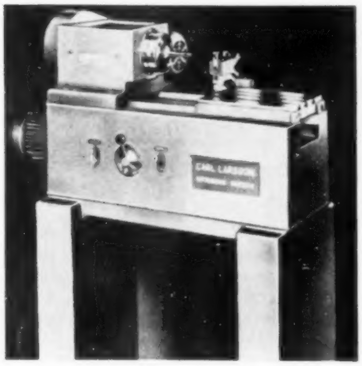
Hydraulic cylinders clamp the part for the milling operation, feed the spindle and make the automatic feed depth adjustments. A coolant system is provided for machining the aluminum parts. Net production rate is 261 pieces per hour for aluminum pistons and 192 pieces per hour for cast iron pistons.

Snyder Tool & Engineering Co., 3400 E. Lafayette, Detroit 7, Mich. **T-4-68**

USE READER SERVICE CARD ON PAGE 267 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Boring Machines

On this line of precision boring machines, made by Carl Larsson of Sweden, a dial indicator, reading in thousandths, and a master facilitate adjustment of the boring tool to the proper diameter. Desired clearance can be set



to the correct figure with the dial indicator.

Available on the machines are automatic feed reverse with rapid and slow reverse feed and adjustable spindle speed from 100 to 5000 rpm.

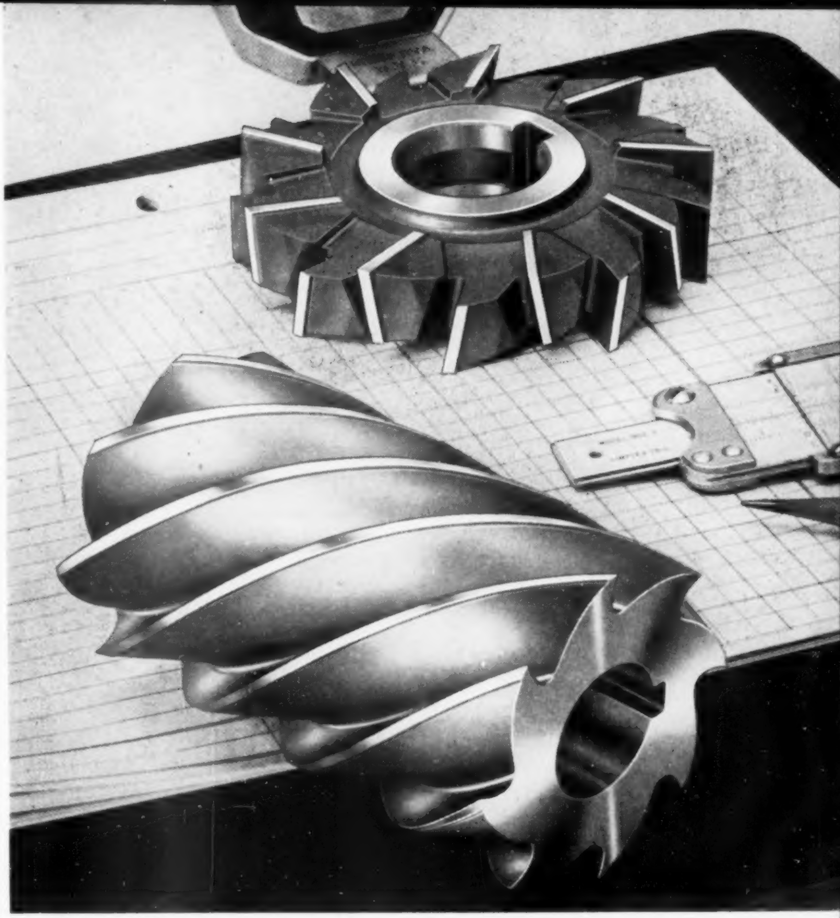
The machines can be used for holes from 0.600 to 1.800 in. Table travel is 8.300 in.

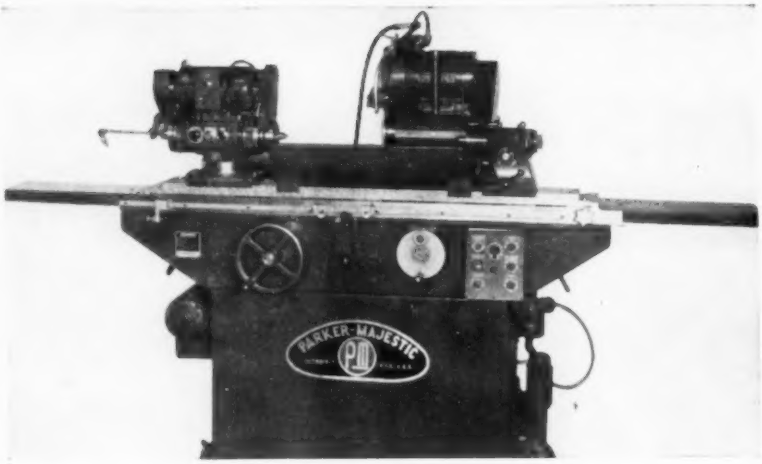
Homestrand, Inc., 9 Addison St., Larchmont, N. Y. **T-4-69**

Universal Grinder

No. 2 universal grinder has a 12-in. swing by 30-in. table travel.

An infinitely adjustable speed drive





motor provides table feeds from 3 to 50 ipm. The same type of drive motor enables workhead rotational speeds of 20 to 450 rpm.

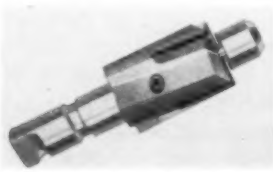
Table reversal is accomplished by an electromagnetic double clutch, which also allows immediate transfer from power to hand feed.

Either internal or external angles can be generated on the machine.

Parker-Majestic, Inc., 147 Joseph Campau, Detroit 7, Mich. **T-4-70**

Carbide Counterbores

Metcut carbide counterbores incorporate a special back-up screw to hold the pilot clear of the cutting edges. This feature prevents flaking of carbide tips caused by excessive back pressure of the pilot. The back-up screw located in the shank of the cutter, is quickly adjusted to hold the pilot in positive position and prevent back pressure on the cutting tips. Deep, strong threads provide a non-slipping grip which resists loosening under vibration or temperature changes. Since no pad is



needed to protect the cutting tips, the face of the cutter can be quickly and easily ground and re-ground without danger of destroying the special surface.

Available with pin-drive, clutch drive, or taper torque shanks, the counterbores may be changed without taking the tool drivers from the spindle.

Cutters are designed with 3, 4 and 6 flutes according to size. They are available in 45 cutter sizes from ½ through 3 in. OD, and are also made special in larger diameters to combine additional operations such as facing and chamfering.

Metal Cutting Tools, Inc., 301 S. Water St., Rockford, Ill. **T-4-71**

USE READER SERVICE CARD ON PAGE 267 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Electrolytic Power Unit For Production Grinding

For applications of electrolytic grinding that require large-volume metal removal, an electronic-electrolytic power supply unit is available that has an output capacity of 1000 amp. The new unit is suitable for large-volume work where wheels from 1 to 3 in. wide are used and there is a large contact area between the wheel and the work.

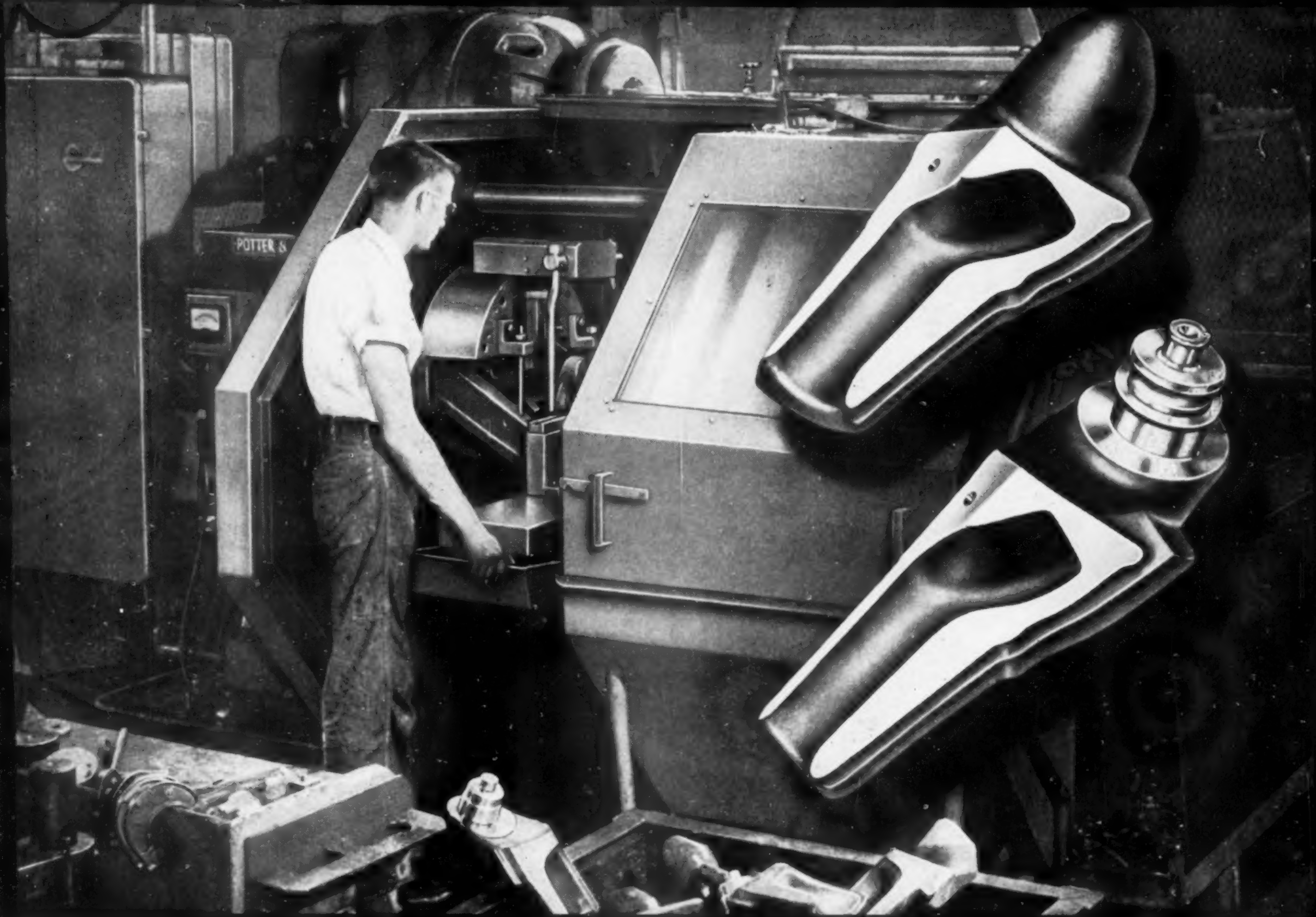
The unit, which acts as both the power and control source for electrolytic grinding, sets the maximum voltage and current to a proper level for maximum removal, depending upon the characteristics of the material being ground. It also automatically prevents sparking and arcing between the wheel and the work in order to obtain maximum removal with extremely good finish.

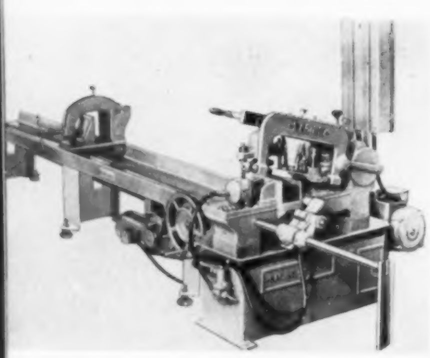
Anocut Engineering Co., 631 W. Washington Blvd., Chicago 6, Ill. **T-4-72**

Automatic Metal Cutters

Utility automatic stock feed metal cutting machines, available in 2 or 4-speed models, provide stepped-up cycling time, giving 1-in. pushup per second. Accuracies to 0.005 in. are assured by a microswitch control.

The machines, Models 66W2A and 66W4A, have been designed for auxili-


POTTER &



ary service, for short run work, to handle overloads or to round out present lines of metal cutting equipment. They will cut cold rolled steels, cast iron, high-speed steels, hard alloys as well as titanium alloys. Speed changes are made easily, facilitated by a fast-operating automatic air vise.

Racine Hydraulics & Machinery Inc., 2000 Albert St., Racine, Wis. **T-4-73**

Removable Dowel Pins

Tapped dowel pins for mounting die details require only drilling of the die shoe to the insertion depth of pin. The pin can be removed quickly and smoothly by working from top of die shoe only.

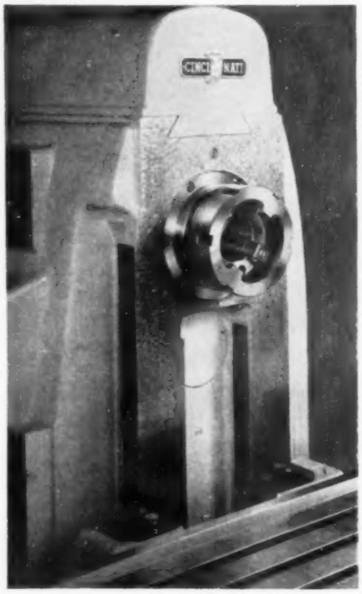
To use them place a short section of pipe over dowel pin to be removed; place washer on top of pipe and insert standard socket head cap screw; using hex wrench turn screw into dowel pin threads—tapped dowel pin is removed quickly, smoothly and with minimum effort.

Richards Brothers Punch Div. Allied Products Corp., 26500 Capitol Ave., Detroit 39, Mich. **T-4-74**

USE READER SERVICE CARD ON PAGE 267 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Spindle Nose for Millers

An unusual spindle nose, called Arbor-Loc, is incorporated in 28 sizes, types and styles of Cincinnati knee-and-column milling machines having No. 50



series spindle noses. With the Arbor-Loc, operators can change collets, adapters and long arbors in seconds to perform a variety of operations with a single setting of the workpiece.

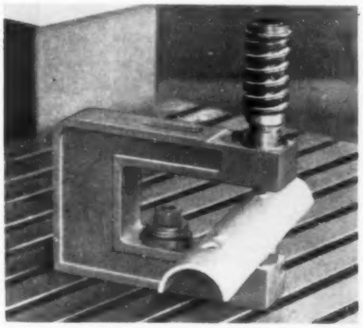
, Cincinnati Milling Machine Co., Cincinnati 9, Ohio **T-4-75**

Hole Punching Units

Type CJ hole punching units ordinarily used in punching flanges, webs, and legs of structurals, and extrusions as well as flats up to a capacity of 1.250 in. dia. holes in 0.250 in. mild steel, can be adapted both for punching and riveting half rounds by use of special interchangeable punches and dies.

Illustrated is a unit riveting spacers to a half-round part. Regular punch and die button have been replaced with a

riveting punch and die button. Nothing is attached to the press ram, which is adjusted to depress the punch to correct 8⅜ in. shut height for proper flattening of the rivets. Interchangeability of tools make the punching units adaptable to a

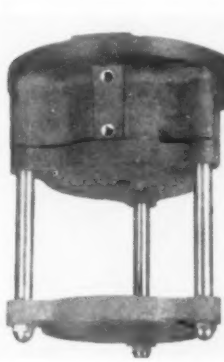


variety of special operations in press setups.

Wales-Strippit Co., Unit of Houdaille Industries, Inc., 211 South Buell Rd., Akron, N. Y. **T-4-76**

Universal Drill Jig

The Anco universal drill jig is an air-operated three-post jig that holds parts square for drilling within a 0.0001-in. tolerance. A built-in restrictor prevents riser plate frof slamming on up or down



stroke. Power factor is 7 times the line pressure, providing an added safety feature. The jig is available in two sizes with a 1.250 and 1.750 clamp movement.

Techni-Tool, Inc., 3860 W. Slauson Ave., Los Angeles, Calif. **T-4-77**

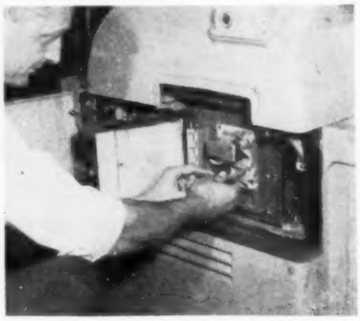
Tape Control for Turret Lathes

Tape Control has been developed as optional equipment for most current models of P&J automatic turret lathes.

It will be available as special equipment on new P&J 3U, 4U, 6DRE40, 8U and 10U turret lathes or can be added

to these models now in the field.

This equipment, which controls all machine motions by means of data on punched tape, cuts setup time and as-



sures maximum utilization of machine capacity.

Potter & Johnston Co., subsidiary of Pratt & Whitney Co., Inc., West Hartford 1, Conn. **T-4-78**

Live Center

This super-precision live center is accurate to 0.000020 in. Extended nose spindle is carbide tipped to assure original precision over long periods of op-

eration. Pre-loaded bearings are sealed and grease-packed for life-time lubrication.

A special spring design compensates for up to 0.020 in. axial growth due to thermal expansion, without impairing accuracy.

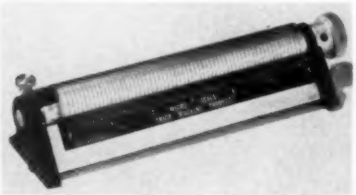
Vee-Arc Corp., Westboro, Mass.
T-4-79

Layout Accessory

Designed to provide a simple dimensional standard for precision setting of layout instruments, the Micro-Scale permits setting dividers and similar tools to an accuracy of 3-place decimals without gage blocks or other standards. The tool has a direct-reading scale and

a graduated dial, calibrated in 0.001 increments from 0 to 6, 12, 18 or 24. Turning a knurled knob moves a helical scribed line on the barrel to provide the two fixed points for layout instrument settings.

The simple, easy-to-use accessory is



available in 6, 12, 18 and 24 in. lengths.

Trico Machine Products Corp., 2664 Grand Ave., Cleveland 4, Ohio. **T-4-80**

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Solderless Terminal Block

No lugs, soldering or screws are required for this terminal block which employs a V-cam action. A quarter turn of the cam opens for insertion of wire, and a reverse quarter turn locks its into

place. Each station can hold wires from 0.010 to three #14.

Willor Mfg. Corp., Dept. A, 825 Bronx River Ave., New York 72, N. Y. **T-4-81**

Linear Bearing

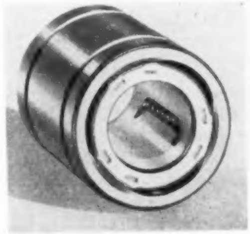
Designed particularly for extra-sensitive applications these linear bearings can be used in many types of components where extremely low friction linear motion is desired.

Forces perpendicular to the axis of the component, called the XA4812 Ball Bushing, cannot cause linear motion; hence, the bearings enable accelerometer designs with low "cross talk." The recirculating ball principle used in the bearings provides unlimited travel which enables accelerometers and other instruments to have a wide range.

Despite its small size and light weight, the instrument bearing will withstand high vibration and G-forces present in missiles and some types of aircraft. Ball retainer is milled from a solid sleeve for extra strength. The outer sleeve, which carries the load, is thorough-hardened to 60 R_C and precision ground to close tolerances on both size and finish.

Construction of the bearing provides through passages between the ball retainer and the outer sleeve that are in register with the relief side of each ball circuit.

The INST-4812 ball bushing is made to the same dimensions and is interchangeable with the standard ball bushing XA4812. It has a bore diameter of 0.2500 in. +0.0000 −0.0003. Nominal outside diameter is 0.5000 in. and length is 0.750 in. The bearing weighs 0.02 lb, has a rolling load rating of 13 lb, and a static load rating of 22 lb.



Bore diameter and the OD are concentric within 0.0005 T.I.R.

Although the bearing can be furnished made entirely of steel, the outer

sleeve and balls are usually made of AISI 52100 steel and the retainer of brass. The bearings can be furnished made entirely of stainless steel when required.

Thomson Industries, Inc., Manhasset, N. Y. T-4-82

USE READER SERVICE CARD ON PAGE 267 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

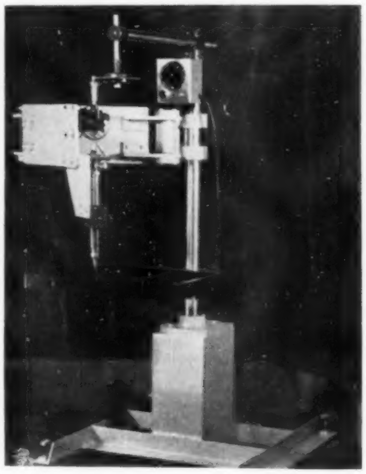
Flame Cutter

Irregularly shaped machine or weldment parts can be cut from steel plate with a flame cutting machine which uses readily prepared template of masonite or sheet metal to guide the cutting torch.

Used principally for cutting steel plate from ¼ to 2-in. thick, average cutting rates of 24 and 10 ipm can be achieved, respectively.

The tracing head is driven through a variable speed gear head motor, designed to cover a awide range of cutting speeds.

Torch cutting equipment for use with

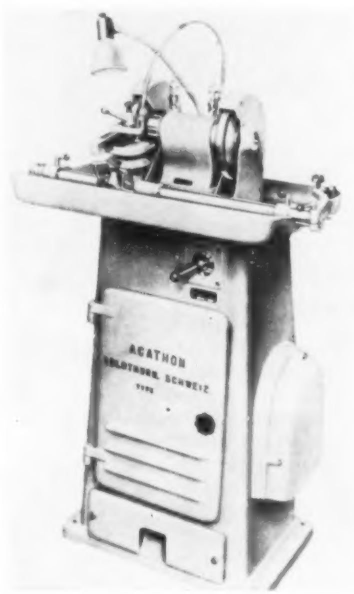


either natural gas, propane, or acetylene can be supplied.

Speedi-Burn Products Co., Inc., 534 Linden St., West Hempstead, N. Y.
T-4-83

Carbide Tool Grinder

With one setting, the Swiss made Agathon 150A carbide tool grinder performs difficult tool-grinding operations with-



out need for angle checking during working. It permits secure tool clamping and micrometer adjustments to give maximum accuracy in grinding and an-

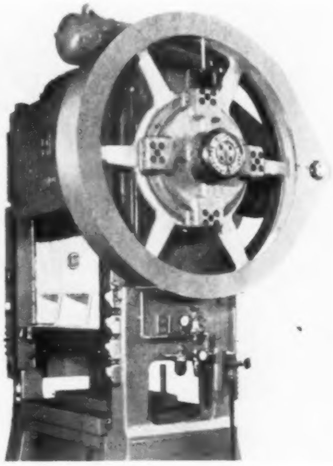
gle setting. Special attachments are available for grinding chip breakers, special tools, single and double toothed cutters, etc.

Grinding wheel diameter is 6 in., recommended spindle speed is 3000 rpm.

Distributed by Carl Hirschmann Co., Inc., Manhasset, N. Y. T-4-84

Press Protection Device

An electromagnetic torque limiting device, called the Bliss-Crary press tonnage Limitor, can be installed on the crankshaft or backshaft of any mechanical press to protect it against dangerous overloads. The Limitor functions as a protective "kickout" by disengaging the crankshaft from the flywheel and drive, at any point during the working



portion of the stroke, when work tonnage exceeds the preset limit.

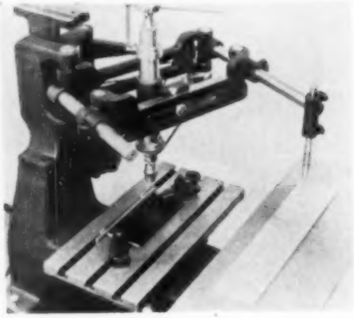
It is usually set to disengage at the rated capacity of the press, but can be set to disengage at tonnages considerably under the press capacity.

The press Limitor can be arranged for electrical or manual resetting in a matter of seconds, while maximum capacity of the press under all working conditions can be set with controls which are normally key-locked.

E. W. Bliss Co., 1375 Raff Rd., S. W., Canton 10, Ohio. T-4-85

Drill Attachment

A quick-action drill attachment for Model UE-3 Panto engraver enables the operator to drill any number of holes from an accurate master template. One inch of vertical spindle travel is provided and depth of feed is controlled by a micrometer stop graduated in 0.001 in. Two precision drill chucks are available to hold drills from 0.008 to 0.062 in.



diam or from 0.025 to 0.125 in. diam.

Four cutter spindle speeds range from 7000 to 18,000 rpm; pantograph reduction ratios range from 1.6:1 to 7:1.

H. P. Preis Engraving Machine Co., 282 Industrial Branch, U. S. Highway 22, Hillside, N. J. **T-4-86**

Loading Arm

This mechanical loading arm is pneumatically powered with finger tip hydraulic control, and provides quick pick-up of fixtures for loading and unloading the company's Spin-Finish machine. Cycle is controlled by a single button which operates the loading arm vertically. For horizontal motion, the operator extends or retracts the telescoping arm.

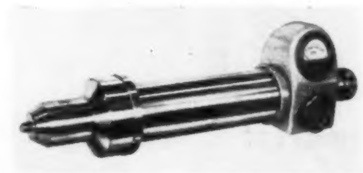
A fork and collar arrangement at the end of the mechanical loading arm permits the operator to pick up fix-

tured parts and place them easily into the machine. A rotary index table, controlled by the machine operator, is used for holding fixtures while parts are being racked and unracked.

Grav-i-Flo Corp., 400 Norwood Ave., Sturgis, Mich. **T-4-87**

Grinding Spindle

A Swedish UVA Turbo-Head has infinitely adjustable spindle speed range of 60,000 to 100,000 rpm. It has an electric tachometer and automatic re-



action valve control of air supply, torque and rpm for peak performance under all operating conditions. A variety of collets and quills is available.

Homestrand, Inc., 9 Addison St., Larchmont, N. Y. **T-4-88**

Drop Hammer

A forming drop hammer, designed for precision blow control and the use of automatic feeding devices, performs such operations as forming, embossing, coining and restriking in a single die impression.

Precise blow control is achieved by

maintaining close pressure tolerances on the air supply and by the fine adjustment of a regulating valve on the hammer's exhaust air system. The electrical control arrangement permits synchronization of feeding devices and the installation of "no stock—no blow" safety devices to protect the dies. When the feeds are used in combination with sorting and orienting equipment, operation can be completely automatic. The

forming drop can be arranged for standard treadle operation when it is fed manually.

Air is used only when the hammer is in operation. Rigid construction assures die alignment. A wide range of blow intensities can be made with simple adjustments. A safety rest supports the ram while making die changes and adjustments.

Chambersburg Engineering Co., Chambersburg, Pa. T-4-89

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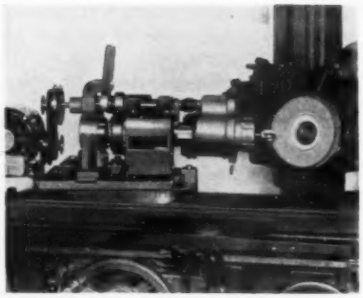
Grinding Attachment

The Circularity grinding attachment provides fast setups for quick form and radial relief grinding, and tapered cylindrical and straight cylindrical grinding. Repeat accuracy provides assurance that after each individual setup all tools ground on the setup will be identical.

Cutting tools to be produced or reworked are held in a collet or between dead centers and revolve on their own axial center. When full length of spiral cutting tools is to be ground for both form and radial relief, the attachment



travel is similar to an OD grinder.

Detroit Reamer & Tool Co., 780 W. Maple Rd., P. O. Box 174, Birmingham, Mich. **T-4-90**

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Drilling Attachment

The Drillspeeder, which is adaptable to any conventional style of drill press spindle, has a maximum speed of 30,000 rpm. The attachment permits use of solid carbide drills and reamers and is

particularly suitable for high-speed drilling of small holes.

It has a gear ratio of 4:1, and chuck capacity of No. 80 to 5/32 in.

Moving parts are completely enclosed and factory lubricated.

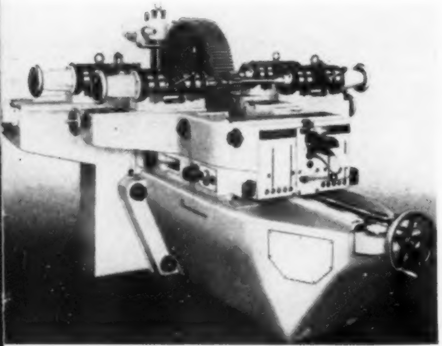
Jarvis Corp., Middletown, Conn.

T-4-91

Gear Tester

Model 126, S & F gear tester for larger gears, will support gears up to 4500 lb, yet maintain a sensitivity and repeatability within 0.00001 in., with maximum loads.

The equipment is used for Diesel locomotive gears, reduction gear drives or other high speed gears. Maximum center distance is 5½ ft. Errors are recorded on the Graphotest full me-

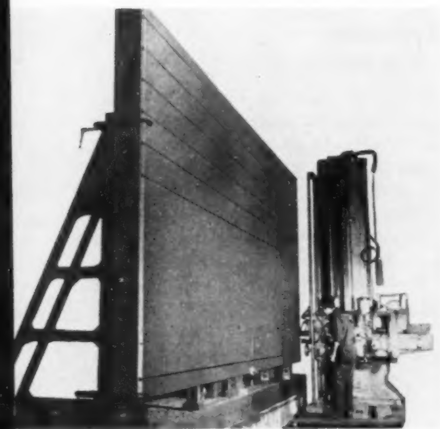


chanical recording comparator.
Kurt Orban Co., Inc., 34 Exchange Pl., Jersey City 3, N. J. **T-4-92**

Layout Plates

Layout plates, with machined T-slots in any arrangement specified, are adjustable 0.002 in. in any direction. Designed to facilitate layout operations and simplify fixture attachments, the plates are available in sizes up to 10x20 ft in one piece or in sections.

All plates can be supplied with 2 in. clamping ledges on both sides and ends



and can be furnished with machined grid lines.

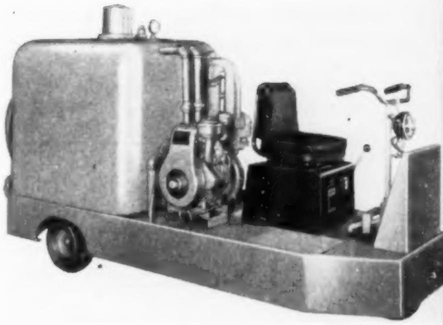
Larger sizes in sections bolted and keyed also are available.

Machine Products Corp., 6771 E. McNichols Rd., Detroit 12, Mich. **T-4-95**

Sludge Collector

Sludge, chips and waste oil are collected quickly from machine tool sumps and settling tanks by the Sludge-Vac machine which transports waste to a disposal area and discharges it under pressure.

The machine is 42 in. wide and 9 ft. 6 in. long, and is driven by a 14.7-hp. two-cylinder air-cooled engine. The vacuum generator is driven by a $7\frac{1}{2}$-hp gas engine with electric starter or by a 5-hp electric motor. It develops a suction of 32 ft of water, enough to lift sludge from pits 10 to 15 ft deep. When the 200-gal. tank is filled, a stainless-steel float operates a valve to cut off vacuum and to pressurize the tank. The sludge is then transported to the disposal area and unloaded under pressure. Discharge pressure is governed by an adjustable safety valve. Sludge and waste can be blown 50 ft. Twenty-five



feet of $1\frac{1}{2}$-in. diam neoprene hose is coiled on a rack at the rear of the machine.

Gorske Industrial Equipment, 132 E. 30th St., Indianapolis, Ind. **T-4-96**

USE READER SERVICE CARD ON PAGE 267 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Coolant Applicator

Easily installed on all types of hand fed or automatic tapping equipment, the Skilco coolant applicator and chip ejector assures long tap life, excellent size control, smooth and accurate threads, and efficient removal of chips.

The tool, which is fastened to the tap shank with a set screw, remains stationary while the inner coolant injection ring rotates with the tap. Because the injection holes are always lined up directly with the tap flutes, the lubricant is forced directly down the flutes. Chips

thus are blown or flushed out continuously while the tap cutting edges are cooled and lubricated.

Distributed by Sealol Corp., Warwick Industrial Pk., Providence, R. I. **T-4-97**

Hydraulic Checking Cylinders

A line of Veri-trol hydraulic checking cylinders is designed for use with air cylinders to smooth out stroke variations under irregular loads. Used with the proper air cylinder, they provide uniform controlled stroke speed.

Maximum checking capacity is 2000 lb on the outstroke, with free return.

Models are available with 2, 4, 6, 9, 12, 15 and 18-in. checking stroke lengths. Speed control is dial set and is load compensated for uniform feed.

Modernair Corp., San Leandro, Calif. **T-4-98**

Toolholders for Lathes

A quick-change toolholder for lathes permits cutters to be preset in their respective holders. Tools then can be changed and reclamped as needed for various operations in a few seconds. Repeat setting is achieved with accuracy of 0.0001 in.

The Boeni master multi-toolholder can be used for large production, small runs or individual work. Number of tools which can be worked is limited only by the number of exchange holders available.

Sturdiness of the case-hardened tools permits large chips to be taken without loss of accuracy.

Karl A. Neise, 404 Fourth Ave., New York 16, N. Y. **T-4-99**

FIELD notes

ASME Prepares to Translate Russian Journal

Translations into English of a leading Russian technical journal soon will be made on a regular basis by The American Society of Mechanical Engineers, which will publish a bi-monthly *Journal of Applied Mathematics and Mechanics* under a $35,000 grant from the National Science Foundation. Announcement of the project indicated that the translations would be "an attempt to correct the present situation in which the Russians are familiar with the content of most, if not all, of our technical publications, while only a few of theirs are translated for use by the English-speaking world." Proof sheets of the Russian journal will be secured in advance of final printing, to permit speedier translation.

The magazine selected is known in the Russian language as *Prikladnaya Matematika i Mekhanika*, usually abbreviated as "*PMM*." It contains theoretical and practical advances made by Russian scientists in mathematics, fluid dynamics and solid state physics.

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education

Washington University has scheduled eight complete basic industrial engineering intensive courses for next September. The courses, which will run concurrently for a two-week period, will include quality control, motion and time study, elements of integrated data processing, engineering economy, plant layout and materials handling, production control, collective bargaining for engineers, engineering psychology, materials and process of manufacturing, and tool engineering.

Primarily the courses are intended for personnel desiring a basic introduction to the subject, and emphasis will be on fundamentals. Objectives are to help prepare the attendee to apply the course concepts in his own organization and to help train others in the principles.

Courses are being presented with cooperation of the St. Louis chapters of the American Society of Tool Engineers, American Institute of Industrial Engineers, American Society of Mechanical Engineers, American Society of Quality Control, American Handling Society, Association for Computing Machinery, and the Society for Advancement of Management.

Details may be obtained from University College, Washington University, St. Louis 5, Mo.

Correction: We regret that the February issue of THE TOOL ENGINEER stated erroneously that Firth Sterling Inc. had made a gift of $24,350,000 to Carnegie Institute of Technology. This should have read a "gift to the $24,350,000 development program."

new companies

Electro-Autosizing Machine Corp. has severed its connection as a division of Industrial Gauges Corp. and is now organized as an independent corporation under the laws of New Jersey. Operations are being carried on in the firm's new factory building at 7 William St., Closter, N. J.

√ √ √

Formation of a West Coast engineering facility has been announced by AC Spark Plug, electronics division of General Motors. The new organization, which will be located in the Los Angeles area, will function as part of the Milwaukee engineering department.

√ √ √

Production now is in full swing at the new Montreal branch plant of The Wallace Barnes Co. Ltd. The new facility for making precision mechanical springs is located in the Pointe Claire industrial district about 13 miles from the city.

√ √ √

Establishment of Haydon Instrument Co. has been announced by A. W. Haydon who has started the enterprise to design and manufacture proprietary electro-mechanical devices. The company is located at 156 W. Liberty St., Waterbury 20, Conn.

√ √ √

A 44,000-sq ft facility is nearing completion in Williamsport, Pa., for Vidmar, Inc., recently created division of Volkert Stampings, Inc. Production, which is scheduled to begin this summer, will be in the manufacture of metal storage equipment for industry.

√ √ √

To replace present facilities at 113 N. Genesee St. in Utica, N. Y., Westinghouse Electric Corp. is constructing a new building for its manufacturing and repair division on a 2½-acre site near Utica. The plant, which will have 25,000 sq ft of floor space, is scheduled for completion in October.

trade associations

American Foundrymen's Society has formed two additional technical divisions in view of the expanded use of metal castings. They include the Ductile Iron Div. and the Die Casting and Permanent Mold division, with committees at the present being considered for melting methods, basic metallurgy, gates and risers, alloying, welding, quality control and heat treating; and the Die Casting and Permanent Mold Div. with possible initial committees in of executive, program and papers, research, alloys and die and mold material.

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Member companies of the National Machine Tool Builders Assn. and the American Machine Tool Distributors Assn. have scheduled their annual sales conference at Purdue University. The meeting, for sales executives, advertising managers and sales engineers, will be held the week of July 28 to August 1. It will be the 13th such program since 1948 to be shared by the two groups.

√ √ √

The American Zinc Institute, Inc., in its annual "Review of the Zinc Industry in the United States During 1957," revealed plans for a research program which will be undertaken by the American zinc and lead industries together with world-wide zinc and lead interests. The program now being formulated will sponsor and stimulate both applied and fundamental research, and a staff is being formed to supervise the program expansion. Zinc and lead research-development projects then will be placed in research centers, universities and engineering schools. Foreign

as well as domestic producers will help finance and supervise the program, according to the report.

expansions

Aluminum Co. of America is planning to spend more than a half-million-dollars for new facilities at its Cressona (Pa.) works. The expenditure will include installation of a vertical impact extrusion press and equipment to produce sheathing for conductor and coaxial cables. The new installations are expected to diversify the Cressona operation's range of products, formerly restricted to aluminum shapes produced by horizontal extrusion presses. Production is supposed to begin later this year.

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Mohawk Tools, Inc. has doubled the size of their existing plant with addition of a single-level building to house precision manufacturing facilities for fabrication of size-optional and special subland tools.

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Casting Engineers Inc. expects to spend more than $1-million during the next two years on what its president, Vincent S. Lazzara, announces as a "new concept in precision fabrication." According to Mr. Lazzara, investment casting will be used to provide a precision blank which will be further worked by coiling, cold heading, etc., to produce a lower cost finished part with superior physical and dimensional characteristics.

√ √ √

Due to expansion of buildings which house Pivot Punch and Die Corp.'s Special Tooling Div., the company's Punch Div. has moved to new and larger facilities. This consolidates all of Pivot's operations at one location.

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Completion of a new plant at 5775 E. 10 Mile Rd., Center Line, Mich. for Hoover Tool & Die Co. was reached with final installation of machinery and equipment. The plant embodies 63,000 sq ft, including 4,500 sq ft for the engineering department.

√ √ √

Service facilities for its tool steel users in the Ohio area have recently been expanded by A. Milne & Co., Inc., with establishment of a new and larger warehouse at 2230 E. River Rd., Dayton 39, Ohio.

√ √ √

A fourth plant for Acoustica Associates, Inc. has been opened at 11601 W. Jefferson Blvd., Culver City, Calif. It will provide more than 6,000-sq ft of space for production of ultrasonic instruments.

new activities

Plans have been completed for a nationwide automation data service to supply operating tapes for numerically controlled machine tools. According to Robert C. Tair, president of the Stromberg-Carlson Div. of General Dynamics Corp., operation of the service will be as simple as sending color film to the laboratory for processing. He indicated ready availability of completely processed magnetic tapes for machining parts should accelerate introduction of the automation techniques into industry generally.

√ √ √

A combined research, development and production center interested in roll forming new metals demanded by technological advances in missiles and aircraft will be inaugurated in August by The Siegler Corp. through its Hufford Corp. division. The center will operate on a plan similar to that which Hufford currently utilized in stretch forming and other special machine tool services whereby a customer contracts for a production run of any extent on machines in Hufford's main plant. In order

is to enable the company to provide faster and more efficient service to users in the Great Lakes area.

√ √ √

A new division has been created by Harsco Corp. with the merger of Ainsworth Mfg. Precision Castings Co. and Globe Imperial Corp. The resultant firm is identified as Ainsworth-Precision Castings Co. Construction is presently under way on a 150,000 sq-ft plant in Tennessee to supplement production for all divisions.

√ √ √

Ed. Castor Associates was recently organized in Wyandotte, Mich., to produce and distribute on a national scale the Edco line of HHS and carbide metal cutting tools. Heading the new firm is Edwin Castor as president and Frank Wilson as general manager. Both men are members of ASTE's Detroit chapter.

√ √ √

Operations of Waterbury Mfg. Co., a division of Chase Brass & Copper Co., have been terminated. All of the production facilities and the technical staff of Chase Brass are being concentrated on brass and copper mill products. The company also has given high priority to intensified research activities by its research and metallurgical departments.

competition

Plans for the 1958 Gregory Award for the year's outstanding contribution to advancement of electric arc stud welding have been announced by Gregory Industries, Inc. The $1500 cash award will be made to "the person responsible for development of stud welding applications or studs which shall be judged most significant" on the basis of: reducing costs for industry; improving appearance, serviceability and life of a product or structure; or performing a function not possible by any other method. Entry blanks and information on the competition may be obtained from Gregory Industries, Inc.

new offices

Electra Motors, Inc. has opened a new office at 10229 Ridgeland Ave., Chicago Ridge, Ill., near Chicago for sales and service to Illinois, Indiana and Wisconsin industry. A warehouse also will be maintained to serve the entire midwest.

√ √ √

A branch sales and service office for Pratt & Whitney Co. has been opened at 466 W. Mount Pleasant Ave., Livingstone, N. J. The facility will be local headquarters for a comprehensive stock of P&W cutting tools. It also will offer

to give the missile and aircraft industry a laboratory approach in the field of roll forming using the spin forge process, Hufford plans to make an eventual investment up to $300,000 in machines and equipment in the center.

√ √ √

Brown & Sharpe Mfg. Co. has established a Cutting Tool Div. which combines design, manufacture and sale of both high-speed steel and tungsten carbide cutting tools.

corporate changes

With the purchase of American Machine & Foundry Co. Turbo Div., Sundstrand Machine Tool Co. has undertaken a major expansion and diversification move into the guided missile field. The Turbo Div., whose 550 employees includes a large staff of scientists and engineers, will be integrated with Sundstrand's aircraft component plant at Denver, Colo. to form a new Sundstrand-Turbo Div. Both facilities will be continued in operation at their present locations.

√ √ √

Formation of an Hydraulics Div. has been announced by Brown & Sharpe Mfg. Co. The new operation, headed by Herbert H. Upton as general manager, combines the company's former Hydraulic Products Div., located in Providence, R. I., the Double A Products Co., located in Manchester, Mich., and the power unit portion of the Rosaen Co. of Hazel Park, Mich. The division, in turn, is made up of the Double A Valve Group, with its Manchester, Mich., manufacturing plant, and the Brown & Sharpe Pump Group, which will continue operations at the B & S Providence plant.

√ √ √

Liberty Aircraft Products Corp. now is operating as the Liberty Aircraft Div. of H & B American Machine Co., Inc.

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Two manufacturing divisions of ACCO, the Allison Div. and the Campbell Machine Div., have merged and will now be identified as the Allison-Campbell Div., American Chain & Cable Co., Inc. The consolidation was said to provide greater flexibility of operation and to better service requirements of industrial customers.

√ √ √

Ace Drill Bushing Co., Inc., has announced formation of a Michigan corporation with a similar name and establishment of a direct factory warehouse at 10620 W. Nine Mile Rd. in Detroit. Purpose of the new operation

a complete application engineering service for all Pratt & Whitney and Potter & Johnson machine tools.

√ √ √

A district sales office for The Warner & Swasey Co. has been opened at 120 Halstead St., East Orange, N. J. George W. Hernker is the district manager in charge.

√ √ √

The Vacuum Equipment Div. of F. J. Stokes Corp. has opened a new sales office at 77 Bedford St. in Stamford, Conn.

agreements

Nice Ball Bearing Co. was appointed sole licensee in the United States for manufacture and sale of Heim-Unibal ball bearings which are designed with solid inner and outer raceways and a full complement of balls, with no loading slot or split race to admit the balls to the bearings.

√ √ √

The Formsprag Co. has obtained exclusive sales rights throughout the United States to the Rawson clutch-coupling manufactured by O. S. Walker Co., Inc.

research

Installation of a new research facility for fundamental study of the die casting process was made public by Aluminum Co. of America. The laboratory, which will be equipped for full-scale pilot plant operations to permit studies to be made under production conditions, will be located at Alcoa's Chicago works. The facility will function as a section of the Cleveland Research Div. of Alcoa Research Laboratories.

new facilities

Visitors not only can inspect machines, but can operate them and make actual production runs on their own workpieces in new showroom facilities of The R. K. LeBlond Tool Co. The facilities, located at Madison and Edwards Rd., Cincinnati, are part of a million-dollar expansion program recently completed by LeBlond.

√ √ √

A new ball mill for blending metals in powder form is being installed at Walmet Corp. The mill, considered one of the largest for cemented carbide production purposes, will make it possible to increase production by about 30 percent and also will step up product quality. The mill has a capacity of

800 lb and will be used to process larger batches of such powder metals as cobalt and carbides of tungsten, titanium and tantalum.

√ √ √

A new laboratory facility has been put in operation by Hastings Plastics, Inc. to provide greater capability for research and development of plastic products and processes.

√ √ √

Commercial Filters Corp., a subsidiary of Ogden Corp., has acquired branch offices and warehouses of W. A. Case and Son Mfg. Co. located in Niagara Falls, Buffalo, Rochester, Syracuse, Olean and Jamestown, N. Y. This distribution organization will operate as W. A. Case Co. division of Commercial Filters.

moves

Maxwell Industries, Inc., formerly located at Macedonia, Ohio, has moved into larger plant facilities at Ashtabula, Ohio to provide space for growth of added tool lines.

√ √ √

Toronto headquarters of F. J. Stokes Co. of Canada, Ltd., subsidiary of F. J. Stokes Co., has been moved to 4198 Dundas St., West.

√ √ √

National sales headquarters for Olin Aluminum division of Olin Mathieson Chemical Corp. have been moved to the recently completed office building at 400 Park Ave., New York City.

√ √ √

Automation Gages, Inc., has moved to larger, more convenient facilities at 100 Seneca Ave., Rochester, N. Y.

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Completion of their move into larger quarters at 14751 Keswick St., Van Nuys, Calif. has been announced by Martin Mann Associates.

√ √ √

LeCount Tool Works, Inc. recently moved into its own new building at 38 Cody St., West Hartford, Conn.

acquisitions

Shareholders of Universal-Cyclops Steel Corp. have approved acquisition of Empire-Reeves Steel Corp. as a wholly owned subsidiary. The combined companies will be starting expansion projects involving expenditures of approximately $20-million during 1958, according to William G. Stewart, president of Universal-Cyclops. Earlier, the forming of Empire-Reeves Steel

Corp. had been approved by the shareholders of the Empire Steel Corp. and the Reeves Steel and Mfg. Co. Consolidation of the three companies integrates plant and research facilities, operating personnel and management skills.

√ √ √

Tempco Aircraft Corp. has acquired controlling interest of Fenske, Fedrick & Miller, Inc., a West Coast electronics company.

√ √ √

Through an exchange of stock, Bryant Chucking Grinder Co. has merged with Ex-Cell-O Corp. Bryant, which now is a subsidiary of Ex-Cell-O, continues to operate under its present Springfield management, and retains the same name. According to announcement of the corporate change, it is felt that through the combination of facilities and skills, products of Bryant can be expanded and will get better and more economical market coverage.

√ √ √

The tool component line from Von Industries, Inc., has been acquired by PIC Design Corp. Purchase of the line of standardized parts increases PIC inventory approximately 25 percent. Von Industries will continue as an exclusive design service.

√ √ √

Alert Supply Co. of Los Angeles has been acquired by Hanson-Van Winkle-Munning Co. Alert will retain its corporate identity as a subsidiary of H-VW-H. The Hanson-Van Winkle-Munning Western office has been moved to the Alert Bldg., 2041 S. Davie Ave., Los Angeles.

√ √ √

Treyco Products has been acquired by Bollier-Damerell, Inc.

√ √ √

Controlling interest in Titanium Fabricators Inc. has been acquired by Santa Fe Western Corp. which now will assist in directing management of the company.

√ √ √

All outstanding stock of Plastray Corp. has been acquired by Bohn Aluminum & Brass Corp. as another step in a long range program of diversification. According to announcement of the transaction, Plastray management will remain intact.

√ √ √

Buhr Machine Tool Co. has announced acquisition of Sidney Machine Tool Co. which now will be operated as a wholly-owned subsidiary. In the transaction, Buhr assumed full control of producing the Sidney line of heavy-

duty metalworking lathes. At the same time, the company made public its plans for expanding the Sidney line to cover a wider range of sizes and applications, and to increase manufacturing facilities to integrate production and assure better delivery.

√ √ √

Kiener Cutting Tool Co., Inc. has been acquired by Maxwell Industries, Inc. The acquisition affords Maxwell entree into the field of carbide and high-speed steel form tools.

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Equipment and inventories of Fiberglass Reinforced Plastic Molding Div. of American Hard Rubber Co. have been purchased by Molded Fiber Glass Co. Production of fiberglass reinforced plastic parts formerly custom molded by American Hard Rubber also will be taken over by the Molded Fiber Glass Co.

name changes

Name of Dana Corp.'s Parts Div. has been changed to Standard Equipment division. The change is believed to emphasize its full divisional status and to better describe its actual function. The change to a self-contained unit within the corporation was announced recently when the division moved into its own warehouse and office building at 253 Waggoner Blvd. in Toledo.

√ √ √

Corporation name of Design Service Co. has been changed to Design Service Co., Inc. to reflect the company's broadened national and international scope of operations.

warehouses

Branch office and warehouse activity in the Toledo, Ohio, area has been expanded by Latrobe Steel Co. with completion of large, modern facilities at 1230 Expressway Dr., Toledo. As a consequence, Latrobe will be able to stock a wider range of grades and a greater depth of sizes of tool and die steels manufactured by the company.

√ √ √

Establishment of a warehouse for distribution of its lines of solid and hollow tool and die steels in the Los Angeles area has been announced by A. Milne Co. The new facilities are located at 4819 E. Patata St., Bell, Calif.

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Joseph T. Ryerson & Son, Inc. is erecting a 36,000-sq ft, two-span warehouse across the street from the Ryerson plant at 5 Clinton St. in St. Louis. The facilities are expected to be in operation in the spring of this year.

who's meeting and where

Apr. 13-18. American Chemical Society. Spring meeting, San Francisco, Calif. Send inquiries to society offices, 1155 Sixteenth St., N.W., Washington 6, D.C.

Apr. 14-15. American Zinc Institute, Inc. Annual meeting, The Chase-Park Plaza Hotels, St. Louis, Mo. For more information, contact institute office, 60 E. 42nd St., New York 17, N.Y.

Apr. 14-17. Design Engineering Show. International Amphitheatre, Chicago, Ill. Obtain further data from Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N.Y.

Apr. 14-18. American Welding Society. Spring meeting and welding conference, Hotel Statler, St. Louis; in conjunction with annual Welding Show, Kiel Auditorium, St. Louis, Apr. 15-17. For details contact AWS, 33 W. 39 St., New York 18, N.Y.

Apr. 16-25. British Electronics Show, Olympia Hall, London, England. Inquiries or space applications may be addressed to the organizers: Industrial Exhibitions Ltd., 9 Argyll St., London, W. 1, England.

Apr. 17-18. Institute of Environmental Engineers. Second annual meeting, New Yorker Hotel, New York City. Write to institute headquarters, 9 Spring St., Princeton, N.J., for details.

Apr. 21-23. Metal Powder Association. Annual meeting, Sheraton Hotel, Philadelphia, Pa. To obtain more data, write association office, 130 W. 42nd St., New York 36, N.Y.

Apr. 22-24. American Society of Lubrication Engineers. Annual meeting and exhibit, Hotel Cleveland, Cleveland, Ohio. Write for more data to society office, 84 E. Randolph St., Chicago 1, Ill.

Apr. 27-May 1. American Ceramic Society. Annual meeting, Penn-Sheraton Hotel, Pittsburgh, Pa. Society office, 4055 N. High St., Columbus, Ohio, can give further information.

Apr. 30-May 3. National Screw Machine Products Association. 25th aniversary meeting, Drake Hotel, Chicago, Ill. Further information is available from association office, 2860 E. 130th St., Cleveland 20, Ohio.

May 8-9. Illinois Institute of Technology. Cost reduction conference, Metallurgical and Chemical Engineering Bldg., 10 W. 33rd St., Chicago, Ill. Get details from LeRoy A. Wickstrom, Illinois Institute of Technology, Chicago 16, Ill.

May 1-8. American Society of Tool Engineers. 26th annual meeting and 1958 Tool Show. Bellevue Stratford, Sheraton and Benjamin Franklin Hotels and the Philadelphia Convention Center. For details, contact Society headquarters, 10700 Puritan Ave., Detroit 38, Mich.

May 5-9. American Society of Training Directors. 14th annual conference, Sheraton-Park Hotel, Washington, D.C. Get data from ASTD, P. O. Box 958, Washington 4, D.C.

May 8-10. American Material Handling Society. Western regional material handling show, Great Western Exhibit Center, Los Angeles, Calif. Contact show offices, 2807 Sunset Blvd., Los Angeles 26, Calif. for more data.

May 26-30. American Management Association. National Packaging Exposition, Coliseum, New York City, and National packaging conference, Hotel Statler, New York City. For details, write AMA Press Relations Dept., 1515 Broadway, Times Square, New York 36, N.Y.

June 8-13. Pennsylvania State University. Industrial tranining clinic conducted in cooperation with the American Society for Training Directors. Write to Prof. Ray S. Farwell, Extension Conference Center, The Pennsylvania State University, University Park, Pa., for details.

June 9-12. National Materials Handling Exposition. Public Auditorium, Cleveland, Ohio. Contact exposition managers Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N.Y. for more facts.

June 9-21. International Organization for Standardization. Triennial meeting, Harrogate, England. U. S. member is American Standards Assn., 70 E. 45th St., New York 17, N.Y.

June 15-19. American Society of Mechanical Engineers. Semiannual meeting. Statler Hotel, Detroit, Mich. For details, write society headquarters, 29 W. 39th St., New York 18, N.Y.

June 15-28. Material Handling Training Conference, Industrial Management Center, Lake Placid Club, Essex County, N.Y. James R. Bright, director, Industrial Management Center, 56B Robbins Rd., Lexington, Mass. can answer inquiries.

June 22-27. American Society for Testing Materials. Annual meeting and apparatus exhibit, Hotel Statler, Boston, Mass. Society office, 1916 Race St., Philadelphia 3, Pa. can give data.

June 22-27. Pennsylvania State University. Seminar in creative engineering. For more facts, contact Prof. Maurice S. Gjesdahl, Extension Conference Center, The Pennsylvania State University, University Park, Pa.

June 26-27. Society of the Plastic Industry, Inc. Midwest section conference, French Lick-Sheraton Hotel, French Lick, Ind. Get other data from society office, 250 Park Ave., New York 17, N.Y.

July 7. Colorado State University. Summer institute in technical and industrial communications. For further information, write Chairman, Dept. of English and Modern Languages, Colorado State University, Fort Collins, Colo.

technical Shorts

PHOTOMICROGRAPHY has shown details to explain how heat treating with a special steel hardening compound creates case hardening that will not chip off. The photos at Hard-N-Tuff Corp. disclosed that a graduated hardness gradient is formed as opposed to the sharp demarcation between case and core.

Film Studies Reveal Reaction During Heat Treat

The films show a cross-section of $\frac{3}{8}$-inch rod of 1015 steel after a hardening which carburized, chromized and nitrided in one operation. The test piece was heated at 1600 deg for 15 minutes, then water-quenched. Case hardness of $65R_C$ was secured at the surface, and appeared to penetrate 0.0144 inch. Gradual blending continued to 0.0164 inch, where the dense hard case became integrated with the tough granular structure of the low carbon core.

* * *

Develop Device For Power Control and Conversion

A SEMICONDUCTOR device, that can change alternating current to direct current and simultaneously can control the volume of power fed into a load, is the latest General Electric semiconductor development. The silicon controlled rectifier, as it is called, should find wide use as a combination electric power relay switch and conversion device. Applications undoubtedly will include use in industrial motor control circuits for speed regulation, use as motor control for automatic machine tools, and replacement of relays in large industrial switching panels.

Current developmental models, about the size of a thimble, are capable of handling loads varying from 200 to 1000-watts at a stud temperature of 125 C. When switching at full rating, the controlled rectifier dissipates only one-half of one percent of the controlled power.

G. E.'s Semiconductor Products Dept., which developed the silicon controlled rectifier, is currently making samples of six models available to industry. These devices are all rated at an average forward current of five amperes at 125 C stud temperature and variously at 25, 40, 75, 100, 150 and 200 volts, peak inverse voltage. All models have a typical gate current to fire of 10-ma at 25 C and a typical minimum holding current of 10-ma.

Foundry Alloy Offers Advantages For Casting

DEVELOPED to produce castable shapes, a highly alloyed foundry product by Calumet, called Zevescal, shows unusual ability to resist extreme abrasive service. When used in tests for severe wear parts it has outworn some materials as much as 13:1.

Physically, this material may be described as a composition of extremely hard, complex carbides, embedded in a matrix of unstable austenite. After being cast to useful shapes in sand molds, the material is subjected to a drastic open grid air quench. Under work loads, it has an ability to acquire an increase in hardness.

New!

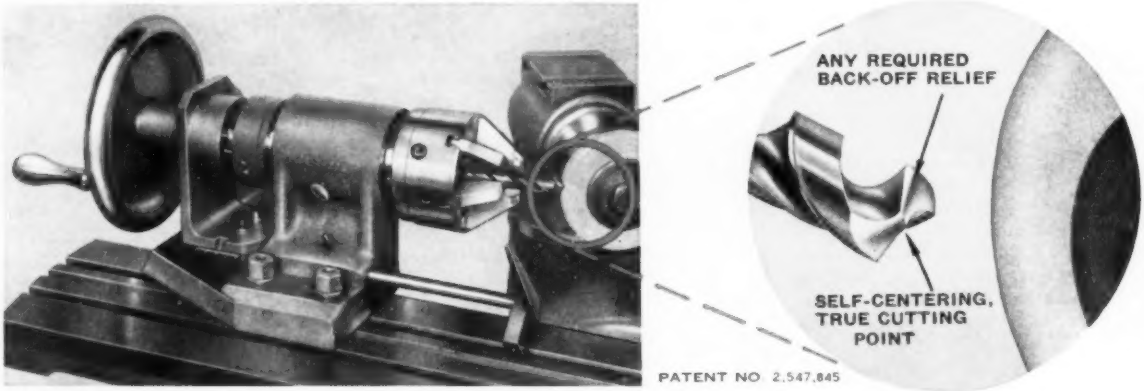
TRUKUT POINT MASTER

Produces and Reproduces "TRU-KUT" Points on Drills

EASIER . . .
FASTER . . .
LOWER COST . . .
CONSISTENT CUTTING POINTS

In many plants, the cost of producing drilled holes is one of the highest manufacturing expenses. Yet, over the years the inefficient chisel edge drill point with its large negative rake angle has remained virtually unchanged.

To secure more efficient cutting action at the drill point, tool room and production personnel frequently regrind chisel point drills by hand. But, hand grinding is costly, time consuming and results are seldom consistent.



NOW! Detroit Reamer & Tool Company offers the simple to use Tru-Kut Point Master—it is comparatively low in cost and eliminates the human variance factor. After quick and easy set-up, Tru-Kut drill points having any required cutting or relief angle can be duplicated time after time on the Point Master—and at a much faster rate of production.

The Tru-Kut Point Master can be used on most cutter grinders, Universal grinders and surface grinders. Standard grinding wheels are used. The front edge of wheel periphery is dressed to a radius that provides the self-centering "Tru-Kut" point.

Types of drills you can resharpen with the Tru-Kut Point Master for more efficient drilling are almost unlimited—crankshaft drills, sheet-metal drills, standard drills, step drills, etc. You can also grind lead angles and chamfers with radial clearance on taps; chamfers, end cuts and chip-breakers on 2-flute and 4-flute tools; chamfers and points on step-drills; thin-out webs at front; and gash cutting edges.

Tru-Kut Drill Points Assure:

- Rounder Holes
- Straighter Holes
- Truer sized Holes
- Practically burr-free Holes
- Less Bell-mouthing
- Self-centering drills
- More accurate positioning
- Longer drill life
- Cooler cutting drills
- Cutting edges from O.D. to center of drill point.
- Less grabbing when drilling thin metal
- Minimum work distortion when drilling thin metal
- Proper clearance on entire cutting edge of point
- Lower drill thrust
- Fewer guide bushings, jigs, fixtures, etc.

For additional design features, benefits, grinding, uses, etc., write to:

DR & T COMPANY

DETROIT REAMER & TOOL COMPANY

780 W. MAPLE ROAD · P.O. BOX 174 · BIRMINGHAM, MICH.

Men at Work

Three changes in executive assignments at The Nylok Corp. involved **Tim J. Buckley,** who is now vice-president and general sales manager; **J. E. (Ned) Johnson,** who became vice-president of production; and **Carl E. Borner,** who was made vice-president of engineering. Mr. Buckley, who is a member of ASTE's Elmira Chapter, was formerly vice-president of manufacturing. Mr. Johnson was vice-president of engineering, and Mr. Borner was northeastern sales manager.

Appointments of **George A. LaCas** as director of the Industrial Div., and **Cyril J. VandeWater** as director of manufacturing has been revealed by A-S-R Products Corp. Mr. LaCas has been director of manufacturing while Mr. VandeWater was previously chief process engineer.

At elections this winter, **Harry Cagin,** president of Halex Die Casting Co., became national president of The Society of Die Casting Engineers, Inc.

Otmar E. Teichmann, former manager of products research in the engineering department of Borg-Warner Corp's Center in Des Plaines, Ill., has been appointed associated director for engineering at the Center.

Harry G. Hilk recently joined Clearing Machine Corp. as general superintendent of its Chicago plant. He brings to his new association 22 years' experience in heavy press manufacturing.

Earlier, Clearing announced appointment of **John Michelotti** as new director of operations for the corporation, responsible for manufacturing, production, engineering and purchasing.

Cleveland Instrument Co. has made **William A. Surzik** plant manager and **Norman E. Prochaska** the new manager of machine control systems. Mr. Surzik joins Cleveland Instrument from Rola Co., Inc. where he supervised production of electromechanical equipment. Mr. Prochaska has been with the company's engineering department for the past year.

Wayne D. Staley, vice-president of The Duriron Co., Inc., was elected president of the Hydraulic Institute during the organization's annual meeting.

Wesley L. Guiles has been named manager of Flexible Tubing Corp's Research, Development and Test Center at Guilford, Conn. For several years he has been manager-engineered products.

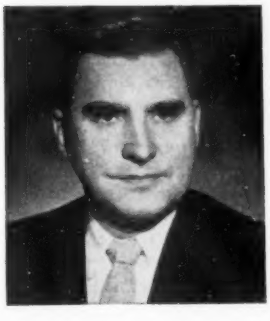
Directors of Bryant Chucking Grinder Co. recently elected **William J. Bryant** chairman of the board and elected **J. Hartness Beardsley** to succeed Mr. Bryant as president of the company. Mr. Beardsley is a member of ASTE's Twin States chapter. Bryant recently became a subsidiary of Ex-Cell-O Corp.

Frank G. Fisher, formerly vice-president and general manager of Rheem Automotive Co. has been appointed president and general manager of the Atkins Saw Div. of Borg-Warner Corp. **S. J. Roush,** group vice-president of Borg-Warner, has relinquished the presidency of Atkins, a position he has held since 1952.

The Carpenter Steel has appointed **Robert A. Kokat** branch manager of the firm's Philadelphia operations; and **Gerald R. Garinger** to the post of assistant branch manager of the Toledo, Ohio, mill-branch warehouse. Mr. Garinger is a member of ASTE'S Toledo chapter.

Ernest M. Riggleman is now vice-president and division manager of American Bosch Arma Mississippi Corp. He was previously vice-president and division manager of Chicago Div., American Bosch Arma Corp.

William F. Wilson, executive vice-president of Gear Grinding Machine Co., has assumed executive duties of Edgar D. Leon who recently resigned as company president. Mr. Leon remains on the board and will act as consultant.



George A. Kendall, who has been chief engineer of Wickes Corp.'s Machine Tool Div., was appointed divisional president and general manager. A veteran of 22 years with the division, he succeeds Carl Bintz who retired recently.

M. A. Chambers was elected president of National Machine Products Co., succeeding John L. Cook who retired. Mr. Chambers, who joined the firm in 1942, was vice-president and general manager and will continue as general manager.

Howard H. Deem was named director of manufacturing for both Valvair Corp. and Sinclair-Collins Valve Co. He previously was supervisor of plant and manufacturing engineering section of Ford Motor Co.'s Cleveland foundry.

William C. Ridge was elected vice-president-production of John A. Roebling's Sons Corp., subsidiary of The Colorado Fuel and Iron Corp. Mr. Ridge, who has been with Roebling for the past 15 years, was previously works manager of the corporation.

Burton Schellenbach has been named vice-president-sales for H. K. Porter Co., Inc. He joins Porter from the Cleveland office of Fuller & Smith & Ross, Inc

Carl L. Sadler, left, general manager of Sundstrand Machine Tool Co.'s Aviation Div., was elected vice-president in charge of the division. He belongs to ASTE's Rockford chapter.

Richard H. Olson, right, general manager of Sundstrand's former Aviation Div., is now vice-president in charge of the new Sundstrand-Turbo Div.

Three appointments recently were made public by The Cincinnati Milling Machine Co. **Carl M. Beach** was named general manager of The Heald Machine Co., a subsidiary of Cincinnati Milling. A vice-president and director of the parent company, he has been its sales manager, a post now filled by **Robert C. Bevis,** former assistant sales manager. Mr. Bevis is a member of ASTE's Cleveland chapter. Third appointment involved **Lawrence H. Cousineau,** vice-president and assistant general manager of Heald Machine, who was made a vice president of Cincinnati Milling. He will continue as vice-president and director of Heald.

New vice-president and general manager of Republic Gear Co. is **Steven S. Gordon,** formr director of sales.

W. E. Hanford has been appointed vice-president for research at Olin Mathiesen Corp. Dr. Hanford has been assistant to the president for research since joining the company last July.

Also announced by Olin Mathieson was the appointment of **Addison S. Farrell** as production superintendent of the Olin Aluminum division rolling mill now under construction near Clarington and Hannibal, Ohio. Mr. Farrell was formerly with Kaiser Aluminum and Chemical Corp.

New president of the Multiple V-Drive and Mechanical Power Transmission Assn. is **H. Merrill Bowman,** vice president of the American Pulley Co. **Dwight H. Lory,** manager of the Texrope Dept. of Allis-Chalmers Mfg. Co., was elected vice-president of the association.

At its recent annual meeting, the Industrial Heating Equipment Co. elected **C. Floyd Olmstead** president for the coming term. Mr. Olmstead is president of Lee Wilson Engineering Co.

James S. Machen now serves as plant superintendent of the C. A. Norgren Co. He has spent six years in the company's engineering and manufacturing activities. Mr. Machen's name was reported in the February issue of THE TOOL ENGINEER as Maches.

Directors of Bohn Aluminum & Brass Corp. elected **Guy H. Pitts** as vice-president of manufacturing to oversee all manufacturing operations. He has been manager of the fabrication division.

Appointment of **Irwin A. Binder** as vice-president for manufacturing has been announced by The Ramo-Wooldridge Corp. He has been assistant general manager of the Tapco plant of Thompson Products, Inc.

According to an announcement from LeMaire Tool & Mfg. Co. **Philip DiFalco** has joined that firm as chief engineer. For the past year he served in a similar capacity with Spartan Design, Inc.

Joseph T. Ryerson & Son, Inc., has announced several appointments in its operating division. **Herbert G. Dent** is engineering consultant to the vice-president in charge of operations. Succeeding Mr. Dent in his former post as director of plant engineering is **Stanley J. Miller,** formerly assistant director.

Robert D. Allison was made general superintendent of Ryerson's Pittsburgh steel service plant, succeeding Charles E. Weston who was assigned to the operating controls division in the company's general offices in Chicago. Mr. Allison was formerly night superintendent of the Chicago plant.

The Aluminum Association, at its recent annual meeting, re-elected both **S. D. Den Uyl** and **Everett G. Fahlman** to serve again as president and chairman of the board, respectively. Mr. Den Uyl is president of Bohn Aluminum & Brass Corp. Mr. Fahlman is president of The Permold Co.

Howard Hightower was appointed vice-president in charge of sales for Hurst Tool & Mfg. Co. He recently resigned from Potter & Brumfield, Inc. where he had been for 22 years.

Airborne Instruments Laboratory, Inc. has announced promotion of **Lawrence J. Torn** to the post of chief engineer. He will coordinate the company's production design activities in the field of industrial control systems.

John D. Reitz, formerly general manager of Symco, Inc., has been elected president of the company.

William H. Shenkle, chief engineer of Rockwell Mfg. Co.'s Instrument Div. at Tulsa, Okla., has been promoted to general manager.

Rockwell Mfg. Co. has made **Philip E. W. Goodwin, Jr.,** general manager of the company's new valve plant at Kearney, Neb. For the past five years he has been general manager of the firm's Sulphur Springs, Texas, valve plant.

Trade Literature

for free booklets and catalogs—use convenient request card, page 267

Live Centers

Extensively illustrated by drawings, 12 page brochure presents line of live centers with accuracy better than 0.0001 in.; includes graphic selection chart, descriptions of each type of center, and tables of specifications and dimensions. J & S Tool Co., Inc., Dorsa Ave., Livingston, N.J. **L-4-1**

Belt Grinding

More than 30 case histories involving abrasive belt machine applications are presented in extensively illustrated 24-page booklet, "How Abrasive Belt Grinding Increases Production at Lower Cost." On-the-job data includes production figures, type of belts used, belt life, fixturing, comparison with prior or alternative methods; also gives stock removal, tolerance and finish specifications. Engelberg-Huller Co., 831 W. Fayette St., Syracuse, N.Y. **L-4-2**

Cold Heading

Eight-page reprint of "What the Designer Should Know About Cold Heading" gives details of cold heading process and includes examples of parts produced by the method; covers advantages, metals that can be cold headed, and information of threading, knurling and other second operations applied to cold headed items. John Hassall, Inc., Westbury, N.Y. **L-4-3**

Worm Gearing

Cut-away photos illustrate 8-page Bulletin 575 which shows how to adjust a set of double-enveloping worm gears accurately with only a set of feeler gages or a dial indicator. Step-by-step instructions cover methods of determining correct gear side position and worm end position. Cone-Drive Gears, Div. Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich. **L-4-4**

Tool Services

Extensively illustrated 6-page folder describes facilities offered available to service tooling requirements emphasizing engineering skill and experience, and listing well known clients. Rutland Tool Service, 1617 E. McNichols Rd., Detroit 3, Mich. **L-4-5**

Cutting Tools

Extensively illustrated by dimensional and cutaway drawings, 50-page Catalog No. 57 offers general information on new Calibore cutting tool units and provides specific specifications on each type in the line. Beaver Tool and Engineering Corp., 500 W. County Rd., Gaylord, Mich. **L-4-6**

Gages

Illustrated 12-page catalog on gages points out proper care and handling as well as what should be avoided; other sections deal with method of ordering gages and what to specify, finishes and tolerances and gives range of tolerances according to American Gage Design Standards. Dorsey Gage Co., Inc., Dorsey Lane, Hyde Park, N.Y. **L-4-7**

Hydraulics

Tables and other engineering data to aid hydraulic engineers and designers, presented in illustrated 40-page Bulletin No. 3300, includes conversion tables, decimal equivalents, hydraulic ram capacities, wire and sheet metal gages, steel pipe tables, bolt tables, specific gravities and strengths of materials; gives data on fluid losses, properties of metal sections, beam formulas, methods for finding moments of inertia, etc. Also describes line of company's presses and their applications. Request only on company letterhead direct from Hydraulic and Compacting Press, Hamilton Div., Baldwin-Lima-Hamilton Corp., Hamilton, Ohio.

Pull Tools

Line of standard hydraulic pull tools for fastener installations presented in extensively illustrated 8-page Form 8-420; includes pull tool nomenclature, and detailed descriptions of each of three basic hydraulic units; gives operating characteristics and information relating to styles, types and subassemblies. Huck Mfg. Co., 2480 Bellevue Ave., Detroit 7, Mich. **L-4-8**

Rotary Seals

Principle of retaining gases, oils or other liquids under pressure is discussed in spiral-bound, 12-page booklet, "Solving the Problem of Seals for Rotary Shafts;" text is supplemented by photos and line drawings including a transparent overlay arrangement showing solutions to typical sealing problems encountered in machine design. Rotary Seal Div., Muskegon Piston Ring Co., Sparta, Mich. **L-4-9**

Electrical Control Equipment

Information on applications, construction details, engineering and operating features plus general data and design specifications on all types of electrical control equipment presented in illustrated 64-page Catalog No. 18. Conveniently indexed in four sections covering automatic transfer switches, contactors, special controls and timing devices; includes price lists. Request only on company letterhead from Zenith Electric Co., Dept. TED, 152 W. Walton St., Chicago 10, Ill.

Chucks

Drawings and photos illustrate 23-page revised Form 1117-C on chucks, collets and chucking equipment; also includes information on power chuck wrenches, air cylinders; special section deals with special work holding equipment, illustrated by job applications. Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis. **L-4-10**

Materials Handling

Various types of materials handling equipment illustrated and described in loose-leaf brochure, "Everything that Hangs from the Crane Hook," which shows nearly 100 items, including automatic and motorized tongs, sheet lifters, rack lifters, motorized rotating hooks, "C" hooks etc.; well illustrated to show equipment in use. Heppenstall Co., Materials Handling Div., New Brighton, Pa. **L-4-11**

Gaging

Eight-page, illustrated Bulletin 8007 discusses gaging and gaging equipment explaining use, applications, operation, advantages of various models; graduated pages provide easy reference. Moore Products Co., Philadelphia 24, Pa. **L-4-12**

Toolholders and Throwaway Inserts

Kendex tooling catalog B-305 discusses 42 styles and 220 different holders for tools with throwaway carbide inserts; well illustrated with dimensional drawings; explains code-numbering system which simplifies ordering. Kennametal Inc., Latrobe, Pa. **L-4-13**

Standards

The 1723 voluntary national standards approved by ASA are listed in 67-page booklet; cover electrical field, civil engineering and construction, photography and motion pictures, textiles, mechanical engineering, safety, ferrous and nonferrous materials and metallurgy, petroleum, chemicals, acoustics and mechanical shock and vibration, mining, automotive, rubber and other miscellaneous subjects. Dept. DD-7, American Standards Assn., 70 E. 45th St., New York 17, N.Y. **L-4-14**

Air Gaging

Twenty-page Catalog No. 327, "General Reference and Order Guide—All Gage Members for All Circuits," introduces general principles of basic air gage instrument design and engineering, explains air gaging as a dimensional measuring system, and deals specifically with three major types of air gage circuits, illustrating each with detailed schematic diagram and explanatory text to show fundamental working principles. Freeland Gauge Co., 9940 Freeland Ave., Detroit 27, Mich. **L-4-15**

Magnesium Alloys

Properties, uses, applications and advantages of magnesium are described in 54-page booklet compiled for engineers, designers, manufacturers and users. Lists nearly 100 applications and includes tables of pertinent specifications and tolerances. Also includes information on aluminum alloys and products. White Metal Rolling & Stamping Corp., 88 Moultrie St., Brooklyn 22, N.Y. **L-4-16**

Tape Control

Drawings, diagrams and photos illustrate 12-page Catalog BR-1 describing tape control system for controlling production of machined parts; discusses how the system works, outlines resultant advantages and economies, and explains how it may be modified; includes typical case histories. Controls Section, Bendix Aviation Corp., 21820 Wyoming Ave., Oak Park, Mich. **L-4-17**

Bushing Selector

Pocket size, plastic slide-rule type selector enables users to choose Acme or ASA standard bushings without refering to a catalog; gives standard sizes for more than 30,000 drill bushings and will also designate OD and ID of liners in decimals, show head sizes and shoulder types and indicate proper lockscrews for slip fit bushings. Acme Industrial Co., 200-222 N. Laflin St., Chicago 7, Ill. **L-4-18**

Electrodes

How to select the most efficient electrode for a particular welding job is discussed in 12-page Weldirectory; descriptions include deposition, arc action, amount of slag, bead appearance and general applications; differentiates between individual electrodes within a family and gives physical properties, current ranges, sizes and welding procedures for each. The Lincoln Electric Co., Cleveland 17, Ohio. **L-4-19**

Belt Drives

Information on selection, installation and use of positive, lubrication-free drives is presented in addition to engineering information in 68-page "Timing"® Belt Drive Catalog TB-58 covering all five basic "Timing" belt pitches. Morse Chain Co., Ithaca, N.Y. **L-4-20**

Bolt Torque

Special report deals with problem of determining required torque for proper tightening bolts according to specific requirements; includes torque-tension data, application of data and a practical example. Skidmore-Wilhelm Mfg. Co., 442 S. Green Rd., South Euclid (Cleveland), Ohio. **L-4-21**

Speed Reducers and Gears

Details on sizes, ranges, capacities and types available in complete line of speed reducers, custom and commercial gears in 180 page, spiral bound catalog illustrated with photos and schematic drawings; includes 38-page section devoted to pertinent engineering data useful to those working with gears. Grant Gear Works, Inc., 154 W. Second St., Boston 27, Mass. **L-4-22**

Cutting Tools

Ten-page catalog 957 describes and illustrates line of Edco cutting tools made of new type steel with special heattreat expressly for forge die sinking trade. Request only on company letterhead directly to Ed. Castor Associates, 93 Oak St., Wyandotte, Mich.

Drives

Illustrated 32-page Bulletin 10600 explains advantages, operation and characteristics of Any-Speed drives, illustrating them with typical performance curves and block diagrams on different types of rotary applications. The Oilgear Co., 1561E W. Pierce St., Milwaukee 4, Wis. **L-4-23**

Vacuum Metallizing

Process of vacuum metallizing and many of its applications are described and illustrated in revised Catalog 780; also contains complete specifications for all current models of company's metallizing equipment. Vacuum Equipment Div., F. J. Stokes Corp., 5500 Tabor Rd., Philadelphia 20, Pa. **L-4-24**

Drilling and Tapping

Complete line of accessories designed to make drilling and tapping machines more versatile or efficient, described and illustrated in 12-page Bulletin AC. Edlund Machinery Co., 48 Huntington St., Cortland, N.Y. **L-4-25**

Belt Finishing

Selection of offhand belt finishing materials and equipment is simplified by illustrated wall chart; lists proper abrasives, grit, belt speed, lubricant and contact wheel for 16 of popular metals and alloys; describes 11 types of contact wheels and gives information on surfaces, hardness and density, wheel action and advantages of each type of contact wheel. Behr-Manning Co., Dept. OBF, Troy, N.Y. **L-4-26**

Countersinks and Drills

Two "Tooling Tips" sheets illustrate and describe (1) solid carbide single flute and double-end countersinks and center drills, and (2) carbide tipped and solid carbide twist drills. Wendt-Sonis Co., Hannibal, Mo. **L-4-27**

Grinding

Grinding room calculator tells immediately how much grinding concentrate to add to a tank for a desired mixing proportion; it also translates grinding wheel diameters and rpm into surface speeds in feet/minute. There is a standard grinding wheel marking system chart on the back of the calculator. Request only on company letterhead directly from The White & Bagley Co., 100 Foster St., Worcester, Mass.

Machining Thermoplastics

Eight-page reprint from *Modern Plastics Encyclopedia* outlines recommended procedures for machining and finishing of thermoplastic sheets, rods and tubes; presents general recommendations for tool design, feed and speed and use of coolants; covers special machining characteristics of acrylics, nylon, fluorocarbons and polyethylene. Cadillac Plastic & Chemical Co., 15111 Second Ave., Detroit 3, Mich. **L-4-28**

Barrel Finishing

Clear explanation of mechanical finishing processes and how company's method is applied to grinding, deburring, descaling, polishing and coloring of metal parts presented in well illustrated 24-page brochure, "Precision Finishes Mechanically." Pictures and describes line of equipment and accessories for this work. Roto-Finish Co., 3700 Milham Rd., P.O. Box 988, Kalamazoo, Mich. **L-4-29**

Presses

Illustrated 24-page Bulletin 264 presents new Series SA-2 two-point, straight-side, automatic presses emphasizing important features and advantages clarified by drawings; includes specifications and dimensions. Niagara Machine & Tool Works, 683 Northland Ave., Buffalo 11, N. Y. **L-4-30**

Hydraulic Presses

Twenty-eight page Catalog 120-D, designed to show how numerous manufacturing problems can be solved through use of company's hydraulic Multipress, contains photos of the equipment in action on production line and gives detailed descriptions of various operations possible on it; illustrated section describes operation of press and accessories. Denison Engineering Div., American Brake Shoe Co., Columbus 16, Ohio. **L-4-31**

Gear Production and Broaching

Extensively illustrated, comprehensive, 24-page Catalog AP57-11 describes complete line of Red Ring gear production equipment and broaching tools; includes general capacity table and descriptions of rotary shaving machines for internal and external spur and helical gears. Indexed for easy use. National Broach & Machine Co., 5600 St. Jean Ave., Detroit 13, Mich. **L-4-32**

Thread Comparators

Both external and internal type precision thread comparators described in well illustrated 12-page Catalog TC-1 stressing special features of equipment; also includes attachments for checking squareness and concentricity of threads. Hanson-Whitney Co., Hartford, Conn. **L-4-33**

Rotary Tools

High-speed steel, carbide, abrasives and diamond rotary cutting tools are all presented in 48-page manual, Catalog No. F-7, designed to help users select correct tool for specific job applications; tools are indexed by type, size and machine application. Precise Products Corp., Racine, Wis. **L-4-34**

good READING

THE DIECASTING PROCESS—*By H. K. Barton. Published by The Macmillan Co., 60 Fifth Ave., New York 11, N. Y. Price $5.00. 220 pages.*

Increased use of diecasting as a production process has accentuated the need for comprehensive information. In this book, the process is described from the basic characteristics and the design requirements of the castings to the types of equipment needed in production plants.

After a short history of the various casting methods, the basic requirements of the process are discussed using comparisons between the various methods. The types of alloys cast, product uses and a detailed description of these production methods are included. A table listing the relative importance of size range, dimensional accuracy, finish, section thickness and complexity makes an evaluation between processes possible. Another interesting comparison has been made between relative costs of the various processes based on initial tooling, tool maintenance, machining, assembly and finishing.

In the section on diecast dies, the component parts and construction are illustrated for various designs of castings. Core slides, rack and pinion mechanisms, sliding die elements and cavity inserts are discussed with the designer in mind. Another section on redesigning for diecasting will also prove useful to the designer and process engineer. A guide to the establishment of dimensional limits for the main alloy groups of diecastings will find use in design and production.

Operational considerations cover the layout of the casting department and the metal-handling system. The secondary operations of machining, assembly and finishing are outlined to illustrate the areas to consider when processing diecast parts. Other related production processes, i. e., impact extrusion, powder metallurgy, investment casting and plastic molding are included to show alternate methods of pro-

ducing the same parts.

The appendixes include information on die specifications, alloy constituents, polishing recommendations for the various alloys and a glossary of imperfections. This glossary will prove especially useful to the student since the common faults of castings are illustrated and discussed.

FASTENERS HANDBOOK—*By Julius Soled, P. E. Published by Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y. Price $12.50. 438 pages.*

As a result of a search for published information on fasteners, the author realized that fastener development has far exceeded the published information on the field. His search extended into the manufacturers' catalogs, published articles, and ASA standards on these materials. The result of the search is this handbook which presents reliable, authoritative, and current reference data on fastening devices orderly arranged for easy reference. Included are sections on rivets, inserts, screws, bolts, nuts and other fastening devices, e.g., retaining rings, pins, nails, masonry anchors and hose clamps.

Each section has a general discussion of the particular fastener with description of the types, materials and ASA standards which apply. For example, in the rivet section, the types of heads and material for large solid rivets are discussed. Then, the general dimensions for small rivets and split rivets are described showing uses for the various types.

The proprietary fasteners data sheets follow each general discussion of the fastener class. Each description of the proprietary fasteners has been verified with the manufacturer for accuracy of content. The outstanding features of each device, its uses and sizes, remarks on installation and the manufacturer's name and address are included.

The processing data and the product information will fill the needs of some organizations for fastener data in a condensed form. This compilation could be used as a basis for standard parts data book.

WHO MAKES MACHINERY?—*Edited by Association of Germany Machinery Mfgrs. Available from Nordeman Publishing Co., Inc., 14 E. 62nd St., New York 21, N. Y. Price $3.50. 800 pages.*

This directory lists the West German suppliers of machinery, equipment and precision tools, product classifications and manufacturers. There are thirty-seven groups into which the products are divided, e.g., machine tools, industrial furnaces, foundry machinery, etc. Each main grouping has sufficient subgroups to describe the products adequately for easy reference.

TOOL ENGINEERING in Europe

By M. Kronenberg
Consulting Engineer

Drilling Research

Thrust and torque in drilling can be recorded automatically and simultaneously by means of an electric resistance bridge in conjunction with a photographic tracer of great sensitivity, according to H. H. Klein, writing in *Werkstattstechnik und Maschinenbau*, No. 11, 1957. The title of his article is "Das Bohrschaubild als Kriterium der Bohrerform und Leistung."

The instrument is, for all practical purposes, inertia-free and therefore responds accurately to all variations of cutting forces. In Klein's opinion, measuring cutting forces is usually a faster method of investigating drilling performance than tool life tests.

A number of examples are cited. The investigation showed a discrepancy between the theoretical formulas for feed force and torque presented by the author, and test results. Feed force should increase and decrease according to a straight-line relationship when the drill enters and leaves the work.

Actually the feed force increases linearly with the feed as the chisel edge enters the work. After this initial stage, in which the spindle of the machine is deflected up and the work is pushed down, the feed force increases more slowly. Similar considerations and conclusions apply to the torque, which should change according to a parabola.

It is possible to determine the effect of various shapes of the chisel edge on drilling performance, as shown by diagrams in the article. Reference is made to Schallbroch's theory that when the main cutting edges are supported by the chisel edge, a drop in torque occurs. The article also covers an investigation of the effect of a variation in the helix angle and in the shape of spiral grooves on cutting performance. Chip breakers on twist drills, developed in Great Britain, have likewise been tested by the author. The chips are broken by a rib located all along the spiral groove,

causing only a small increase in feed force and torque.

The effect of variation in the clearance angle, the thinning of the chisel edge, wear of the drill and similar topics are also diagrammed in Klein's article.

Measuring Tool Angles

An instrument developed for accurately measuring the rake and other tool angles is described in *Maschinenmarkt*, No. 98, Dec. 1957, by M. Ehrenreich. The title is "Schneidwinkelmess-Geröt."

Usually the true rake angle, or the back rake, is measured by placing a short straightedge on the face of the tool and measuring the light passing through the gap. This method is inaccurate because the tool face is often a curved surface rather than a plane. In the instrument described, two contact points replace the straightedge. The contacts are connected to an electric circuit, and red and yellow lights appear when the two points contact the surface. It is then possible to read the rake angle from a scale built into the instrument. Such a circuit would also be useful for measuring inclined (but not straight) surfaces other than tool faces.

Cutting Tools

Ceramic materials and their method of operation are discussed in an article published by H. Cornely in *Zeitschrift des Vereins Deutscher Ingenieure*, Vol. 99, No. 21, 1957, pages 1697-1700. New developments in metal turning, drilling, milling, thread cutting, etc., are reviewed and numerous references are given.

Solid Drilling

Equations are established relating cutting forces and unit cutting pressures to cutting speed, torque and drill design in an article by H. Forster, published in *Fertigungs-Technik*, Vol. 7, No. 11, 1957, pages 507-511, under the title "Wirtschaftliches Bohren ins Volle." A graph on double-logarithmic paper is given, plotting cutting speed versus feed for various drill steels.

Ceramic and Carbide Tools

Several articles on the development of ceramic and other tools in Eastern Europe appear in the same issue of *Fertigungs-Technik*. An article by E. Heymel deals with tests with ceramic tools. The title of the article is "Zerspanungstechnische Untersuchungen an Keramischen Werkstoffen." Wear on the flanks and faces of ceramic tools, particularly C 40, is examined for various cutting speeds, feeds, chip thicknesses and tool geometries.

An article by A. Richter gives a survey of progress made in Eastern Germany with ceramic tools. The wear, tool life and surface finish obtained with various methods for clamping ceramic bits are described. This article is entitled "Der Gegenwärtige Stand in der Anwendung der Schneidkeramik." R. Wehner and R. Kohlermann discuss titanium-base sintered carbide cutting tools in an article entitled "Hartmetalle auf Tic-Basis für Schneidzwecke."

Abrasive Cutting

In the French periodical *Machine Outils Français*, Vol. 22 (126), 1957, pages 117-123, diagrams are presented relating wheel life to the diameters of cut-off metal bars and tubes. The article, by R. Robin, is entitled "Le Tronconnage par abrasion."

The author stresses the importance of cooling and indicates that abrasive cutting off can be used to produce thin sections of high surface finish. Problems of fracture of wheels are discussed and reference is made to American standards limiting peripheral wheel speed.

Microstructure and Chipless Forming

The deformations taking place in the microstructure of sheet metal in deep-drawing and similar operations can be studied now more closely than before, due to the improvements in measuring technique, according to an article by H. Wiegand in *Werkstatt und Betrieb*, No. 11, 1957. The title is "Uber den Einfluss des Feinbaus von Werkstoffen und ihrer Oberflächen bei der Kaltumformung."

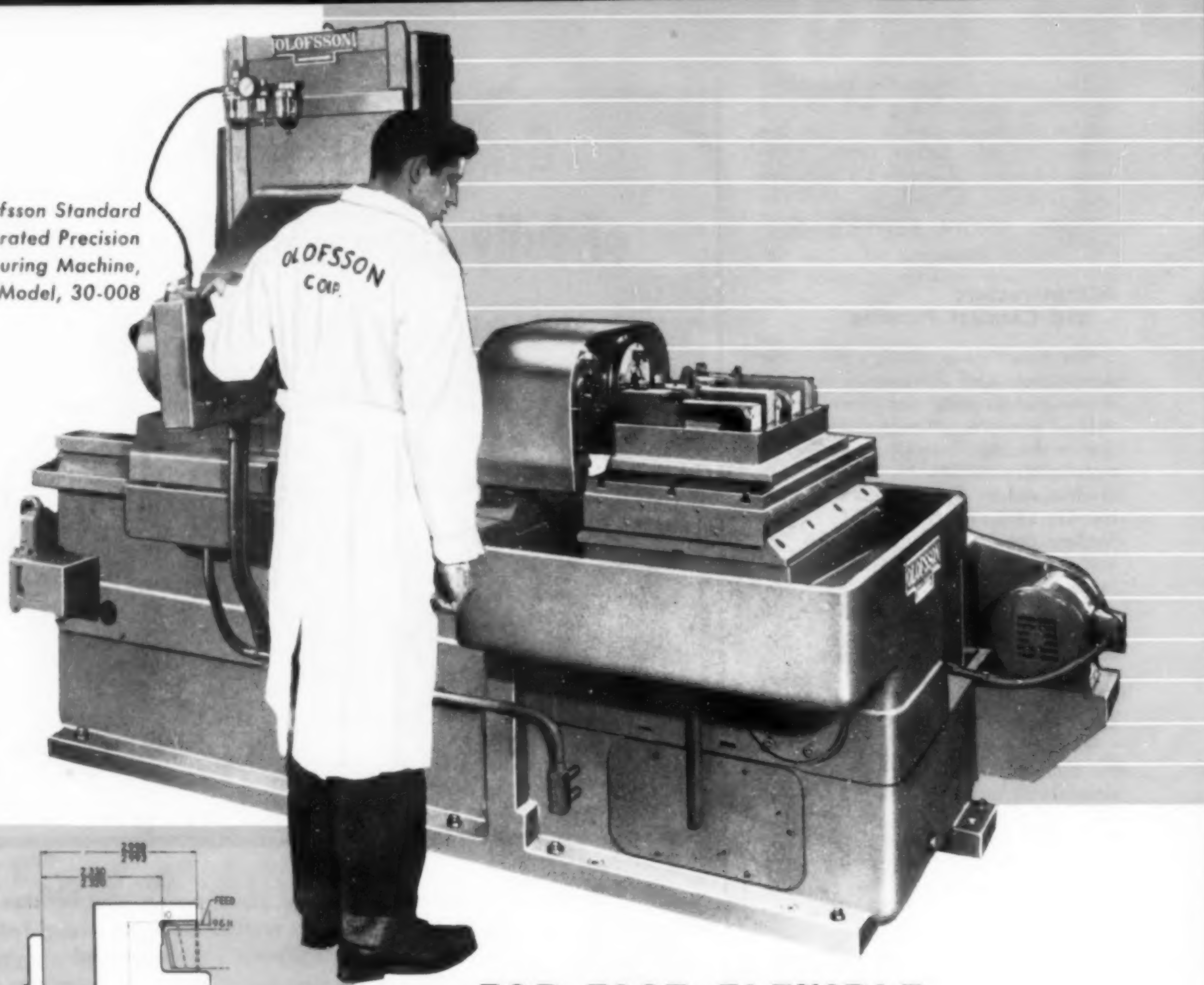
The author refers to the progress in infrared spectography, electron microscopy and other methods and indicates that they are tools for the research scientist not yet fully utilized in the field of deformation of metals.

He has found that our knowledge of the changes taking place in the microstructure of metals has been considerably extended. The deep-drawing capacity of sheet metals depends, to a large extent, on the atomic lattice of the material and also on the chemical composition. The work-hardening capacity and the tendency of some structures to become brittle must be taken into consideration.

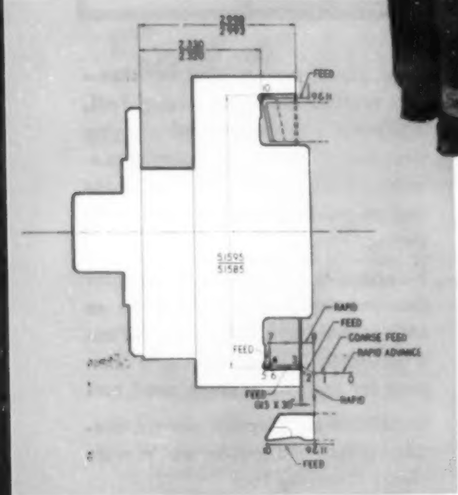
The microstructural changes at the surface, however, have not yet been sufficiently investigated. This is due to the limited space where the deformation takes place. The mutual effects between the surface of the work material and that of the tool play an important role.

The author first discusses the microstructure as it is affected by melting temperature and the cooling of the iron, and then considers the imperfections and dislocations in the atomic lattice. Different types of lattices are explained and typical microstructures are illustrated. Strain hardening is the result of dislocations in the atomic lattice of steels. The slip planes interfere with each other, blocking the mobility of the atoms. Strain hardening can also be explained by disappearance of voids in the atomic structure under stress.

As far as the microstructure at the surface is concerned, the author opines that further research is required to supplement his theories on the sliding of two work surfaces. He discusses in detail also the chemical-physical construction of surface layers, the geometrical shape of surfaces and the effect of plating on the microstructure.



The Olofsson Standard Cam Operated Precision Contouring Machine, Model, 30-008



A TYPICAL APPLICATION
The part: transmission rear brake drum.
Material: pearlitic malleable iron.
Operations Performed: boring, facing, chamfering and undercutting.
Rate of Production: 70 pieces per hour.

FOR FAST, FLEXIBLE COMBINATIONS OF PRECISION BORING, TURNING AND FACING

. . . the New OLOFSSON Standard Cam Operated Precision Contouring Machine Model 30-008

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CUTTING FLUIDS . . . research, development and practical application

By George Vosmer
Manager
Cimcool Products Div.
and
E. J. Ritter
Director of
Cimcool Laboratories Products Div.

CUTTING fluids are an integral part of most metal-cutting operations and greatly influence the results obtained. They should therefore be considered as important as the cutting tools themselves and their contribution is essential if the highest possible efficiency is to be obtained in the metal-cutting operation.

Types of Cutting Fluids

Simply stated, a cutting fluid is a liquid that is applied to the tool and workpiece in order to obtain better results in a metal-cutting operation. The results desired are higher production rates, higher accuracy and better finish, and lower cost of the operation, without introducing any disadvantages such as corrosion, foul odors or harm to the health of the operator.

There are four types of cutting fluids in common use: soluble oils, chemical emulsions, chemical solutions and straight cutting oils. The first three types may be classified as water miscible fluids, and are customarily diluted for use with 10 to 100 times their volume of water. Soluble oils, for the most part, consist of a mineral oil plus an emulsifying agent. They may or may not contain other ingredients, but their major ingredient is oil. Chemical emulsions, by contrast, contain a relatively small amount of oil, which is present only incidentally and as a carrier for the chemical ingredients which are necessary to meet the demands of metal-cutting operations. The solution type products are composed of water-soluble chemicals which are dissolved, rather than emulsified, in water to provide transparency and other advantages in some operations. Straight cutting oils, composed of mineral oil plus extreme-pressure friction reducing agents, have been in use for many years and are still necessary on some operations. However, they possess the inherent disadvantages of fire hazard, excessive smoking, slipperiness and general uncleanliness; hence, there is much to be gained by replacing them where possible with suitable water-miscible fluids. Research and development of these water-miscible fluids have improved them to the point where they can do more and more of the operations previously handled with oil.

Tool Life and Performance

Certainly a cutting fluid must contribute to increased tool life, to better finish, and to a higher rate of production. Development of products which meet these fundamental requirements calls for an understanding of how a piece of metal is cut. Early research in our metal-cutting laboratories has

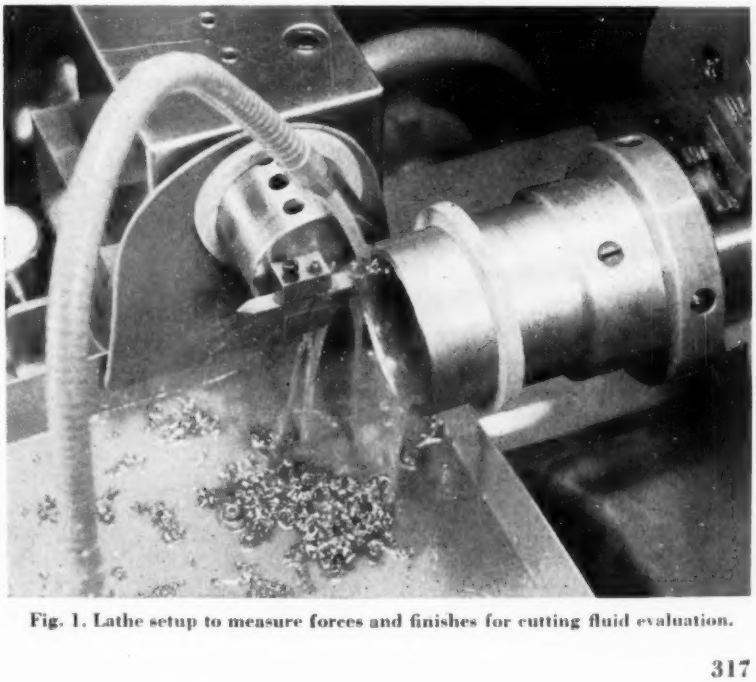

Fig. 1. Lathe setup to measure forces and finishes for cutting fluid evaluation.

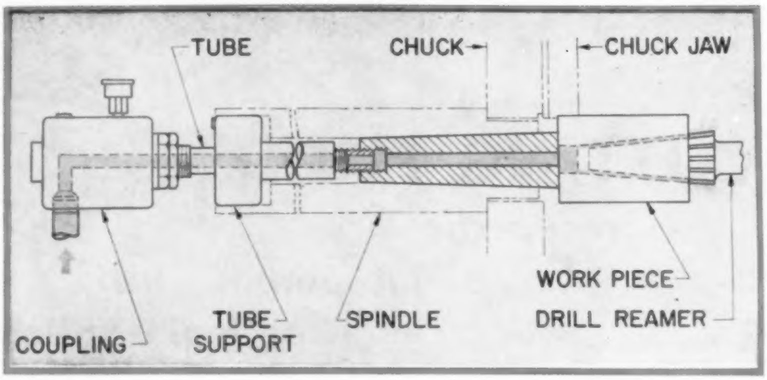

Fig. 2. Application of coolant through machine spindle can be employed on jobs such as the machining of castings or forgings having cored holes.

shown that a tool removes metal not by splitting it off as you would split wood with an ax, but by deforming it as a snowplow does when it displaces snow. The chip is formed by displacing the metal along the "shear plane." When metal is deformed it gets hot. Heat is also developed by friction between the chip and tool face, but it has been found through research that deformation is the source of about 75 percent of the heat that wears out tools. There is no way to get around deforming the metal, it has to be done; but the generation of heat due to deformation is a function of the thickness of the chip. For the same thickness of "bite," the chip can be made thinner by changing the shear angle. If the shear angle is small, a great deal of metal deformation results, making a a thick chip, and generating a great deal of heat. If the shear angle is increased, the thickness of the chip is decreased. Thus the distance sheared is decreased and consequently the generation of heat is diminished. It was found that the shear angle could be decreased by reducing the friction at the tool-chip interface, a most important fact learned in the search for a longer tool life. A tool lasts much longer if it is kept cool. A tool is heated mainly by the deformation of metal. The larger the shear angle, the less the deformation. The shear angle can be made large by reducing friction at the

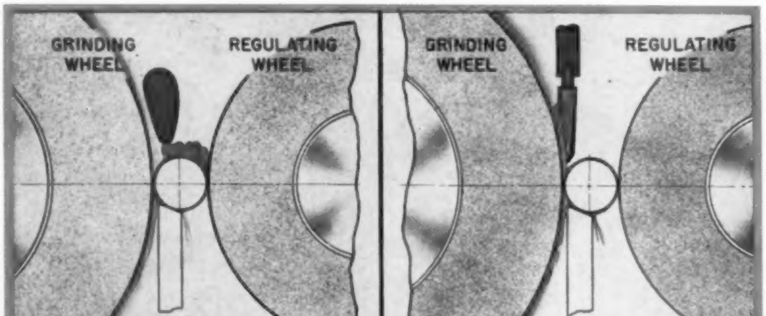

Fig. 3. This grinding fluid nozzle forces coolant through an air stream and the cutting fluid acts as both a coolant and a friction reducing agent.

chip-tool interface. Obviously, all that is needed, then, is to reduce the friction at the chip-tool interface.

Research in the laboratories of The Cincinnati Milling Machine Co. has shown that friction at the chip-tool interface can be reduced if a separating film is provided by chemical reaction between the cutting fluid and the chip. This film must be a low-shear-strength solid because liquid lubricants cannot maintain a separating film on the microscopic contacting spots at the very high temperatures and pressures encountered. In order to evaluate chemicals that would be effective under these conditions, it was necessary to set up special testing procedures. One of these procedures is the radioactive tool-test method which was described in the opening paper on this program. It has been used in this investigation to evaluate the effectiveness of various chemicals that may contribute to increased tool life.

Other means for evaluating potentially good chemical friction-reducing agents are by the measurement of forces and finishes. An appropriate lathe setup for this work is shown in *Fig.* 1. Here, extremely severe conditions of chip crowding and high tool forces occur, similar to those encountered in tapping and threading. A V-shaped tool ground with low clearance angles is fed axially into the wall of a piece of tubing at a low feed and speed. The tool is mounted in a tool-post dynamometer which measures horizontal and vertical forces, which are recorded on Sanborn recording equipment calibrated in pounds.

This test is a valuable tool for screening possible friction-reducing chemicals. Many have been screened and quite a few have been found that are very good, but there are other requirements that must be met. For example, friction reducers must perform satisfactorily on a variety of different shop operations as well as under these particular test conditions. In order to do this, these experimental chemicals are incorporated into actual cutting fluids that are tried under various shop conditions. However, before these further tests are carried on, it is necessary to make sure that such ingredients are not toxic nor a source of skin irritation to the operators. These points can be checked in a number of ways: first, consideration of the chemistry of the particular ingredient; second, information supplied by the manufacturer of the ingredient (such as skin and eye tests run on rabbits) and patch tests run on large groups of people.

The metal-cutting tests previously discussed and the trying of various formulations under actual shop conditions lead to the development of fluids giving improved metal-cutting performance. Improved performance is the primary reason for using cutting fluids, but there are important secondary requirements which must be considered. For example, the fluid must not contribute to causing rust or rancidity.

Corrosion

Workpieces and the machine are both exposed to the cutting fluid and if, for any reason, it were corrosive the result would be damage to expensive equipment and the possible loss of workpieces worth thousands of dollars. In order to understand the problem, we must differentiate between the types of corrosion that occur with water base cutting fluids and those that occur with cutting oils. Most metals, when in contact with water, air, and minerals are subject to corrosion. The type commonly observed on iron and steel is called rust. Such action is electrochemical and actual electrical or battery cells are formed between the metal surfaces which are the electrodes and the liquid electrolyte which is composed of water, and the minerals and oxygen it contains.

It is apparent, then, that corrosion will occur where metal is in contact with water containing oxygen and minerals. Therefore, any cutting fluid mixed with water should contain inhibitors which will prevent corrosion from occurring. There are two main types of inhibitors suitable for use in cutting fluids. These are known as polar and

passivating. The polar types are long chain chemical compounds that are chemically reactive on one end. They function by attaching themselves to the metal surface at the chemically reactive end. If a sufficient number are present, they act as an insulating film to prevent rust. The other type, the passivators, are made up of chemicals that react with the surface of the metal to form a film that will prevent rust.

Of course, all rust inhibitors are not equally effective. Many of the polar and passivator types have been known for a long time, but they are not effective enough to be used under the varied conditions found in machine shops where a cutting fluid is used. Therefore, research was done to find more effective ones. Investigation of the structure of known rust inhibitors suggested others that might be more effective. The ones that appeared outstanding in the laboratory were incorporated into experimental cutting fluids, and were tested under actual

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shop conditions. By such means the rust control characteristics of cutting fluids have been improved over a period of years.

A different type of corrosion can occur when using straight cutting oils. Such corrosion is normally due to chemical reaction rather than electrochemical action. Some cutting oils contain active sulfur which reacts directly with certain metals such as copper to form copper sulfide. This is the black stain that may occur when machining copper with such a cutting oil. Other cutting oils contain sulfur-chlorinated compounds, some of which can absorb small amounts of moisture present in the air, thereby hydrolizing and forming hydrochloric acid which is extremely corrosive in nature. This is what usually occurs if stain appears on steel parts when they are being machined, especially during humid weather. It is possible to incorporate inhibitors into cutting oils that will tend to prevent both reactions from occurring, but the best approach is to use cutting oil concentrates that are not subject to these conditions.

Shop Control

Research has built good rust inhibi-

tors into cutting fluids, but proper handling and good control in the shop are necessary to realize the full benefit. Too lean a mix, which might result from replenishing machine sumps with water only, will lead to inadequate rust or rancidity control, and to poor tool life and finish. On the other hand, too rich a mix will be unnecessarily expensive.

One of the best ways to obtain control of cutting fluids is by a pre-mixing method. This is rather easy to accomplish no matter whether the shop is large or small. In the case of the smaller shops or departments, the mixing tank can be a fifty-five-gallon drum with the top removed. As the volume of make-up material increases, larger tanks can be utilized. If a central circulating system is being used, it affords a means of proper control on a larger scale. By premixing, better control of the cutting fluid will be obtained, with improved corrosion control and greater economy of operation.

Rancidity

Another type of research involved with cutting fluids is in the field of bacteriology. Results of such research are cutting fluids which minimize formation of foul odors and safeguard the health of the operator. So-called rancid, or Monday-morning odors, that occur with some cutting fluids are due to the growth of bacteria, all of which are not necessarily harmful to the operator. As a matter of fact, there are thousands of different kinds of bacteria and many of these are harmless and do not even cause odors.

The first step in a scientific approach to this problem is to isolate the different types of bacteria and find which are harmful, which are not, and which produce foul odors.

There is a direct correlation between the amount of oxygen used and the activity of the bacteria. If they are growing, reproducing and active, they will use a relatively large amount of oxygen.

Again, as in the case of any other ingredients employed in a cutting fluid, care must be taken to avoid the use of any bactericide that would be toxic or a source of skin irritation. This type of research has provided cutting fluids that are safe for shop use and provide a high degree of control of bacterial growth. It must be borne in mind, however, that in using cutting fluid in the shop, it is always possible to experience contamination of the cutting fluid from some outside source. In such cases, the

bactericides employed in the cutting fluid itself may not be able to overcome the extreme conditions encountered. Under such conditions, it is usually necessary to clean the machine thoroughly to eliminate the source of contamination, and to use an additional amount of bactericide as a temporary measure to kill off any bacteria that are present. The better the bactericides and the cutting fluids containing them, the more economical it will be to use such a cutting fluid because it will last longer in the machine without changing. When a solution type cutting fluid is being used, bacterial control is not a problem, because solutions are not suitable media for bacterial growth, unless the fluid is contaminated by an outside source. In this case, an effective bactericide can be employed as a separate additive to clear up the rancidity. Straight cutting oils generally do not produce odors due to bacterial growth, but some of them have unpleasant odors in themselves. It is usually possible to avoid this by the proper selection of the cutting oil that does not produce odors.

Other Requirements

So far, only the main cutting fluid requirements of improving tool life and finish, rust control and bacteria control have been considered. Several other desirable characteristics are important, however, in formulating a high-quality fluid. Emulsion type fluids must be easily mixed with water without agitation, and the emulsion must be stable in hard as well as soft water. Our investigations have proven that preformed emulsions of small particle size have the greatest stability and mixing characteristics.

For economy, it is desirable to have low carry-off, obtained with low viscosity of the mix. In grinding fluids it is desirable that the grits settle promptly so that they are not recirculated with the fluid. And of course, cutting fluids should not interfere with the working of machine elements by sticking or gumming ways or turrets.

Other characteristics are desirable from the machine operator's standpoint. If possible, the fluid should be non-smoking and clean; splashes on clothing should dry quickly and without stain or skin irritation. Slipperiness of a cutting fluid is unsafe and can lead to accidents, such as injury due to dropped workpieces or falls due to oily floors.

Application

From our discussion it is evident that improvements have been made and will continue to be made in cutting fluids. One of the very important factors is, however, that a good cutting fluid cannot be fully effective if improperly used. To get maximum results, it is necessary to maintain proper control, as described previously, and also to make sure the fluid is applied properly. Experience has shown that best results are obtained by supplying the cutting fluid to cutting tools in a copious flow, with little pressure. An exception to this may occur in such applications as drilling, reaming and tapping, where fluid can be supplied under pressure through the shank of the tool without danger of splashing or being deflected. Much can be gained by the proper design of a cutting fluid supply system, by providing adequate size piping and by making sure that there are no restrictions to maximum nozzle flow at low pressures. A simple rule of thumb which was found to give good results is that the gallons of cutting fluid per minute should equal the maximum horsepower required for the cut. Performance on many operations employed in shops today can be improved by minor modifications of the cutting fluid supply system. *Fig.* 2 shows a distributor that can be employed when machining castings or forgings which have a cored hole. Utilizing the hollow spindle of the lathe and applying the fluid through the spindle from the rear insures an adequate supply of cutting fluid for the entire length of the hole being drilled, reamed or tapped.

Better application of the cutting fluid can also improve performance in grinding operations. Because of its high speed of rotation, the grinding wheel acts as an air pump, taking air through

the sides and the bore, thus developing a relatively high velocity film of air around its outside diameter. This tends to prevent coolant that is merely flooded on the work from getting down to the point of contact of wheel and work, and thus creates a void space or pocket at this point. By using a nozzle such as illustrated in *Fig.* 3, it is possible to force the fluid through the resulting air stream. Thus, both as a coolant and friction reducing agent, it becomes useful between the wheel and the work. When employing this method, it is also necessary to make sure that the cutting fluid still floods the workpiece in order to keep the temperature of the piece being ground at the lowest possible point.

These few illustrations show that it is possible to obtain better results by making relatively simple, inexpensive modifications to the existing general-purpose cutting fluid supply systems on many machine tools. Actual tests have shown increases in tool life of as much as 100 percent, together with other benefits such as improved surface finish, greater accuracy and the reduction or elimination of steam and smoke.

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Waste Disposal

A good water-miscible cutting fluid will have a long useful life; the length of time varies and depends on the type of work being done and conditions the fluid is subjected to. At the end of this time it must be disposed of. Legal restrictions in some areas prohibit disposal of used fluids as such. In such cases, it is necessary to process the fluids so as to meet local regulations. Since low oil content is a common requirement, it is usually necessary to break the emulsion. This can be done by the addition of various chemicals, such as waste acid, calcium chloride, or sodium chloride, followed by a settling period, to allow the broken-out oil to rise to the surface. The settling tank or basin may be run batchwise or continuously, and should be large enough to provide sufficient settling time for the volume of waste cutting fluid to be handled. The broken oil can then be skimmed off, and burned or otherwise disposed of, and the clear-water phase run to waste. Because of the wide variety of local regulations, it is not possible to set down rules to cover all cases.

Conclusions

In order that a cutting fluid may act as an aid in performing the metal-cutting operation, it must increase tool life, improve finish, and permit a high rate of production. It must also provide good rust and rancidity control, and must not be toxic or harmful to the operator.

Research has provided products which meet these requirements. Continued efforts will result in even greater improvements in cutting fluids—improvements that will keep abreast of the other advances made in the metal-working industry.

From a paper presented at Cincinnati Technical Activities Seminar. The Cincinnati Milling Machine Co., Cincinnati, Ohio.

▼ ▼ ▼

Quality Control—Management's Job

By H. Thomas Hallowell, Jr.
President
Standard Pressed Steel Co.
Jenkintown, Pa.

Quality control is not merely an "aid"

to management. It's now an imperative "need" for the future productivity and profitability of the business enterprise —your business—not to mention the survival of our nation. This is growing importance as you might expect, is brought about by the increasingly faster pace of things today.

We're playing, or we should be playing, an entirely new ball game—as the sputniks, atomic energy and each day's new developments make increasingly clear. We're really living in an age now where things are just moving faster —mentally, physically and psychologically—where we're dealing with bigger figures everywhere, including wages. Where, as the size of things go up, paradoxically the little things become more important—where there is growing demand for better parts, more economical parts, truly interchangeable parts—where national defense may hinge on a mere handful of guided missiles—and where almost anything is cheaper in industry than a customer's quality complaint which can lead to lost business. In other words, for most of us tomorrow has arrived a little sooner than we expected.

Management is responsible for the profitability of the enterprise. And it's in the area of profits that the quality segment is becoming an over-riding management concern—a fundamental and rewarding part of management's job!

What is quality control? Well it revolves around the relationship of products to standards, doesn't it? And whose job is it to set standards? Again management!

Today, in the atmosphere of higher cost trends with the increased tempo of technology, the higher speeds, the higher temperatures, the higher forces, make mistakes more and more expensive as you all know.

Just when mistakes are becoming more costly, they are also becoming much more likely. That's the result of an increasing complexity of design, a growing number of parts, a multiplying quantity of mechanical and electrical, pneumatic, hydraulic and electronic components.

Things are just getting more and more complicated!

A reflection of this concern is the growing interest in reliability. It's already a branch of engineering in the missiles and military electronics fields. Reliability—as a property of a product —is nothing more than the probability that it will do its job under the conditions to be encountered. That's not asking a lot, is it? So the determination and knowledge of product reliability is

becoming increasingly more necessary and vital.

Well then, we need more quality and reliability. That means more quality-oriented products, organizations and people. Most of all, it means management that lives and breathes quality. For quality thinking must emanate from the top in order to permeate the whole organization.

It follows that management has the responsibility to provide the capital for the investment in gaging and the other necessary tools of quality. Today you must use a legitimate production method—bailing-wire techniques are becoming increasingly hazardous—and sound ways must be used to help the machine operator do an acceptable and economical job. Remember, the production operator is the man who does the work and if he does it right, you have no problems and neither does your customer.

Management must also see that its quality control people and entire supervisory group have access to the latest thinking and tools of the trade. Today there are some fundamentally new tools, gaging equipment and quality control techniques that should be more widely known and used—the lot plot, advanced statistical sampling, indicating gages

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for sampling by variables. I would also include here attendance at important quality and standards conferences for that refreshing and necessary exchange of ideas. And last but not least, be sure you keep higher management informed on the latest developments in your field—the field of quality control.

Let me tell you about some of our recent experiences with screw threads, by way of example.

There's just no need for threaded fastener fit problems, today or in the future, provided you deal with a company that has an enlightened quality attitude. This is the case despite the fact that today as we approach 1958:

- There's still no one universally accepted means for gaging screw thread diameter.
- All threading tools have built-in errors and many commercial dies have more than is permissible for the production of quality threads.
- Many of the gages now being furnished

are not sufficiently accurate or adequate for the job.

We've licked our thread quality or thread size reliability problems by the following simple approach—though I must say that "simple" to me means getting to the very heart of the problem, not always an easy matter.

- We start with a minimum-error tool —one we most likely made ourselves.
- Put it on a machine that has a consistent and predictable performance.
- Assign a conscientious and trained operator to do the job. You're certainly not paying a man to produce bad work, and we find operators want to keep their work within the tolerances.
- Provide indicating measuring devices at the machine so that the operator knows at all times in what part of the tolerance he's producing.
- Take all in-process inspectors out of the department, except those who are controlling nonmeasurable characteristics such as etching and magnaflux. However, be able to identify each operator's production.
- Concentrate statistical quality control techniques in final stores receiving inspection.
- Use statistical quality control on the production floor temporarily to help overcome some particularly knotty problem.

What does all this do for us? Well, we find that production costs actually go down. In-process reject rates are now near zero. In one plant we had only 80 customer complaints all last year out of a total of 575,000 transactions. That's only 0.014 percent—fourteen-thousandths of one percent!

From a paper delivered at the American Management Association's special conference on quality control in action. American Management Association, 1515 Broadway, New York 36, N. Y.

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Large Forgings for Aircraft

By C. R. Cramer and A. Kastelowitz

Republic Aviation Corp. Farmingdale, L. I., New York

Large forgings reduce weight and cut assembly time in fighter airplane production. In addition, their strength and compactness lead to definite design advantages. With the advent of 35,000-ton presses, it has been possible to forge larger parts. A new process—

die quenching of aluminum forgings—has made it possible to satisfactorily forge long, flat parts such as spar caps. Over-form and springback effects can be controlled by varying the quench procedure. The mechanical properties of the material after die quenching and artificial aging are consistently better than those of control specimens.

Ten years ago when we used smaller forgings more compatible with the size of presses available we retained 70 percent of the forging after machining. Five years ago when we went to large complicated forgings the size of the press and the state of the art forced us to machine away in chips as much as 50 percent of the forging. Now with new methods such as die quenching,

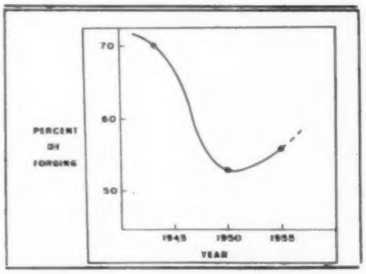

Fig. 1. Forging weight remaining after machining.

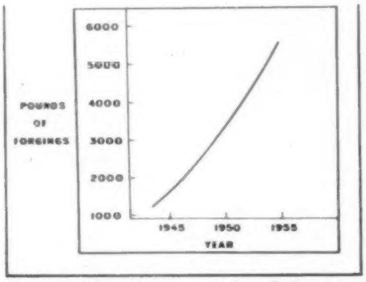

Fig. 2. Trend in pounds of forgings per fighter plane.

draft angles reduced to one degree and even zero degrees in some cases, and larger presses with better controls we can see that the trend is toward less machining. The present figure at Republic shows 57 percent of the forging remaining after machining. We hope that in the not too distant future we will return to the former figure of 70 percent remaining after machining. Trends are illustrated in *Fig.* 1.

The poundage of forgings has been increasing on each new design, *Fig.* 2. First, forgings definitely save weight. Secondly, the final cost of a piece ma-

chined from a forging will be from 20 to 25 percent cheaper than an equivalent part assembled from many pieces. This, coupled with the improvements in the art, certainly indicate a continued trend to the use of more and more forgings.

From a paper presented at the Annual Meeting, Society of Automotive Engineers, Inc., 485 Lexington Ave., New York 17, N. Y.

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The Balance Sheet on Education

By
Rear Admiral H. G. Rickover, USN

Chief, Naval Reactors Branch
Division of Reactor Development
U. S. Atomic Energy Commission

The powerful thrust of Sputnik's launching device did more than penetrate outer space. It also pierced the thick armor encasing our complacent faith in America's present and future technological supremacy. It blasted the comfortable conviction that only in an atmosphere of personal independence and political liberty can science and scientists flourish. It shook the belief, long taken for granted, that a high standard of material well being is both the outward manifestation and the necessary basis for technological progress.

It did greatest damage to our trust in the American educational system—up to now almost as sacrosanct as motherhood. Harsh words are being said about its methods no less than about its aims. For rightly, Sputnik has from the first been seen as a triumph of Russian education. Reams of words and figures have filled the newspaper columns in recent weeks, describing Russian education, comparing it with ours, trying to pinpoint where we have failed in the vital educational task of motivating and training the skilled professionals needed by our country while Russia seems to have no trouble turning them out in vast numbers—three times as many engineers as we, for example.

We are asking searching questions about the aims of education in a modern technological society and how our schools can best achieve them. We are finally coming out of our traditional educational isolation and looking at the educational systems of other countries of western civilization in order to compare them with ours.

Sputnik may well be the catalyst which brings about drastic and long

overdue reforms in utilizing the nation's intellectual capacities. It may thus do in matters of the intellect what Pearl Harbor did in matters industrial and military. Then as now a dramatic occurrence suddenly revealed that we had failed to develop our capacities to their maximum potential. But as we found then that in a national emergency we could take prompt and vigorous action and perform industrial miracles, so I am convinced we can now take similar action and perform educational miracles.

Faced with this formidable and ruthless adversary who has openly promised "to bury" us and who grows daily in industrial and military might—what are we to do?

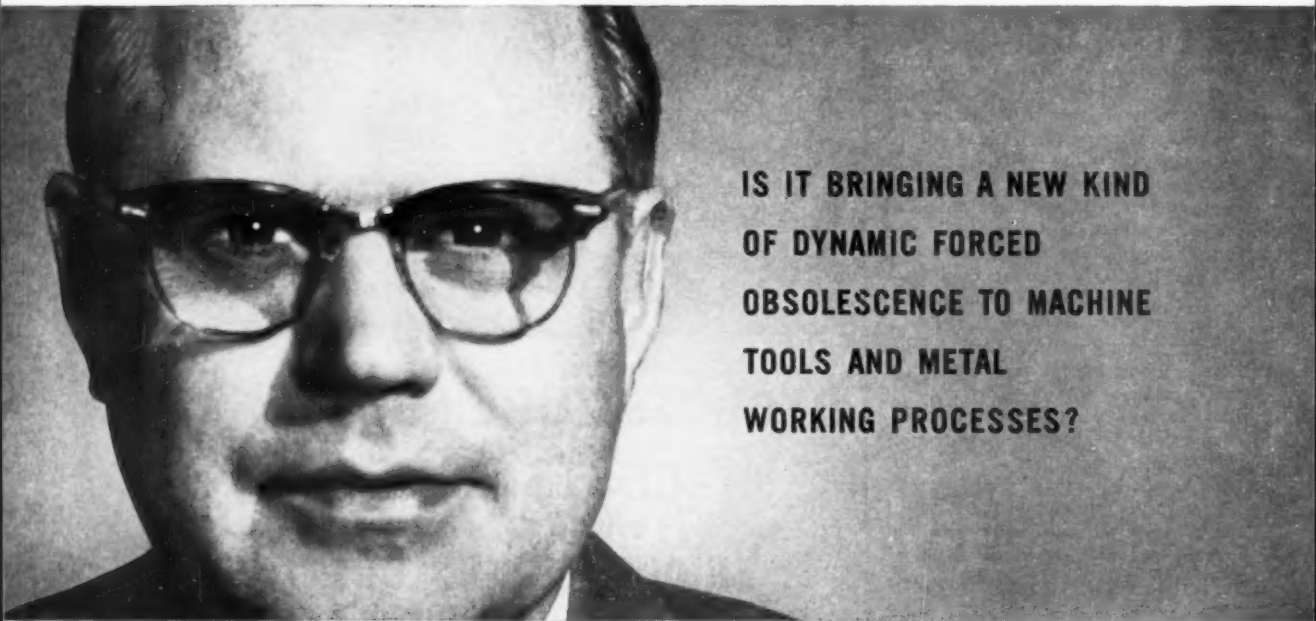
First, I think, we must awaken America to the danger facing the nation—making public all the facts, and the impact of unpleasant truths. I have no doubt that as a people we have enough patriotism, let alone enlightened self-interest, to recognize that we must put greater effort into the things which will make America strong, even if this may require a reappraisal of cherished convictions and ways of life; even some material sacrifices, which I doubt would be large.

Second, and equally important I believe, we must reverse our treatment of the scientist and trained professional. It is easy to make a good living in this country without much serious education. Hence, the temptation to do this is so great it can only be offset by deliberate actions to elevate the status of the trained professional in terms both of prestige and of material reward. We had better stop calling scientists long-hairs, egg-heads, little men with beards. In the present mood of chastisement, scientists have been speaking up and telling us that such disparaging remarks hurt and may discourage many a young man from choosing the hard intellectual road to science rather than the easy and pleasant road to business success and country club living.

But merely spending a lot of money on scientists, scientific research and new military projects will not be enough. In final analysis trained manpower can only come out of a thoroughly reorganized educational system with totally different aims and considerably higher scholastic standards. To carry through such drastic reforms is a formidable undertaking but reforms of similar magnitude have been carried out elsewhere in the past.

From a paper presented at a luncheon sponsored by The Thomas Alva Edison Foundation, Inc., Engineering Society of Detroit, Rackham Educational Memorial Bldg., Detroit, Mich.

The bright new era belongs to those who



C. R. DE VLIEG, Executive Vice President, DeVlieg Machine Company.

Here at Fair Street, we think that the answer unquestionably is "yes."

We have felt it already, as you must have, too, in your business. The evidence is everywhere indicating that we are racing into the greatest industrial revolution of all time. We are backing our own conviction with the dollars it takes to build the new highly efficient plant you see pictured here.

Technological progress of the last 10 years more than equals any previous 50 years in the history of mankind.

And still, relentless research goes on. One breakthrough into new areas of science and engineering is quickly followed by another. New materials, new methods, new processes, higher accuracy control and most significant of all, *vast product changes affecting every business are in the making.*

From it all is emerging what virtually amounts to a new philosophy in running a metalworking business. The basic tenets now are clear to those who expect to control their own destiny in the bright new, bitterly competitive era ahead.

The old "needs" now are becoming "musts." Greater flexibility in design and production to meet competitive product changes can no longer be ignored. The need for shorter time cycles and lower inventories is imperative. Already, old established theories of obsolescence are being knocked into a cocked hat. And the time is fast approaching when no shop can afford costly boring jigs and fixtures or the intolerable months of lead time required to manufacture them.

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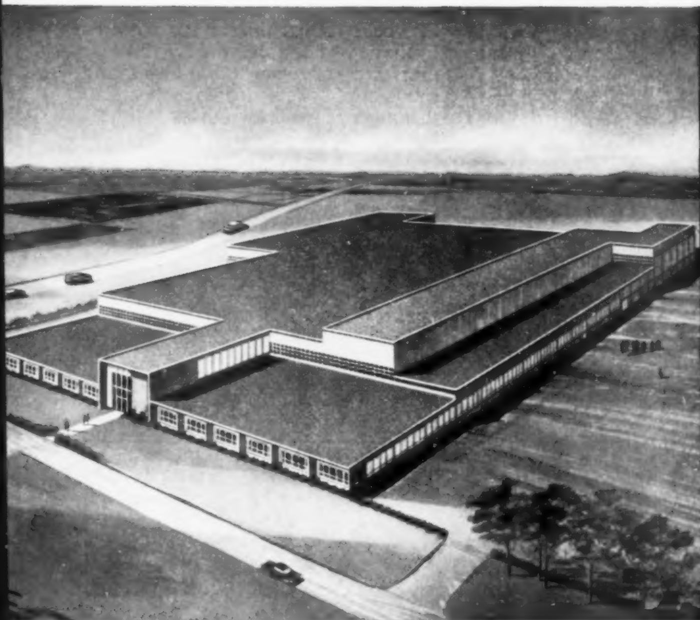

New 130,000 sq. ft. Jigmil plant to be completed in June.

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ACCURATE HOLES AND FLAT SURFACES
IN PRECISE LOCATIONS

Fortunately, our amazing Jigmil supplies answers to many of the new "must solve" problems involved in design flexibility, time cycles, and costly inventories. Many case histories show that savings usually cover its cost in a few months. Savings resulting from reduced inventory alone often are enough.

Few people believe the claims we make for this machine. We know they sound fantastic. But 90% of the men who come to Fair Street to see a demonstration buy Jigmils.

Now while you and we have a breather period, will you come, too? Come simply to watch. The Jigmil does the selling. And we promise answers that will pay off handsomely for you—*proved in advance.* A Deferred Payment Plan is available, if desired.

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FERNDALE • DETROIT 20

To every user of threaded fasteners:

New SPS Thread Metrology Labs will help you

- **Analyze and eliminate thread fit problems**
- **Establish more reliable gaging techniques**
- **Check and set inspection gages accurately**

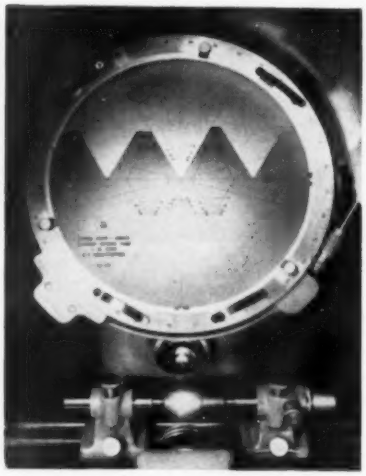
As part of a continuing program to help threaded fastener users meet today's demand for increased product reliability, SPS has just opened new Screw Thread Metrology Laboratories at three key points across the country. The three identical facilities make available to you the advanced gaging techniques, precision measuring machines, and screw thread technology employed by SPS itself. These laboratories are located at:

Jenkintown, Pa.—Just north of Philadelphia, SPS headquarters plant, Highland Ave.
Phone: TUrner 4-7300

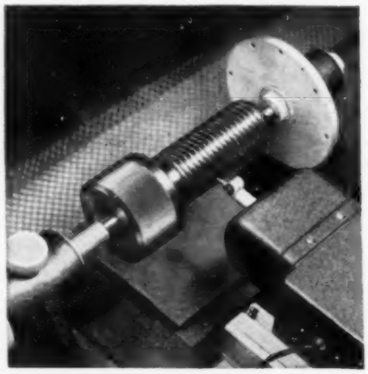
Cleveland, Ohio—At the plant of Cleveland Cap Screw Co., an SPS Company, 4444 Lee Rd.
Phone: LUdlow 1-3000

Santa Ana, Calif.—SPS Western 2701 S. Harbor Blvd.
Phone: KImberly 5-9311

Basic services of the new SPS Metrology Labs include analysis of fastener fit problems; checking and setting of screw thread inspection gages with highly accurate equipment; and setting up of reliable thread inspection methods in conformance with recognized standards. In addition, these new SPS facilities will serve as a clearing house for the latest information on threaded fasteners.



OPTICAL COMPARATOR. Standard equipment at each SPS Metrology Lab. Permits magnification of screw thread profiles from 10x to 100x on 14 in. viewing screen. Precision: .0001 in.



ELECTROMECHANICAL LEAD TESTER. Checks from 4 to 80 threads per in.; lengths to 4 in.; diameters to 8 in. Precision: .00001 in.

Each laboratory—a showplace of modern measuring equipment—is temperature and humidity controlled to insure the reliability of its instrumentation. Each has complete equipment for precision measurements of all screw thread elements—major, minor and pitch diameters, half-angles, lead, radii, etc.; for gage setting; and for inspecting thread forming tools themselves if necessary. Equipment at each location includes electromechanical measuring machines for determining thread dimensions to the nearest one hundred-thousandth (.00001) inch; primary reference standards, of even greater precision, for calibrating these machines; optical comparators for studying screw thread profiles enlarged 100 times; and profilometers that measure surface smoothness as close as one millionth inch. This and all the other equipment will be devoted especially to measurement and inspection of the following classes and types of thread:

Unified Screw Threads—Class 3A, 2A, 3B, 2B; National Standard Screw Threads—Class 3, 2; Tapered Threads—ANPT, NPTF types. (Special thread types or forms can also be measured or inspected with the facilities of these laboratories.)

SPS believes that the services rendered by the new laboratories will help fastener users set up or augment their own thread size control systems to eliminate misfits that might cause delays on the assembly line or compromise the reliability of finished products.

Fastener users are invited to put these laboratories to their service any time. Simply contact your SPS salesman or distributor or get in touch with the lab nearest you. And remember, whether you have any immediate fastener problem or not, a visit from you will be welcomed. Write for free booklet describing the laboratories in detail. STANDARD PRESSED STEEL CO., Jenkintown 37, Pa.

hiRf
High Reliability factor

At SPS we apply a dynamic standard of quality—continually refined—so that our fasteners will always have the high reliability factor required by today's faster speeds, higher temperatures, and greater dynamic forces. By using SPS fasteners in your assemblies, you increase overall reliability—the certainty of predictable performance under actual service conditions.

For more information on the full meaning of reliability, write for a copy of the new SPS booklet "Concerning High Reliability."

We also manufacture precision titanium fasteners / write for free booklet

See us at the ASTE Show— May 1-8, Booth 322

SPS **Jenkintown • Pennsylvania**

Standard Pressed Steel Co. • The Cleveland Cap Screw Co. • Columbia Steel Equipment Co. • National Machine Products Co. • Nutt-Shel Co. • SPS Western • Standco Canada Ltd. • Unbrako Socket Screw Co., Ltd.

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HEMCO PROCESS GAGES

AND OTHER NEW

MORSE PRODUCTS AT

BOOTH III

PHILADELPHIA, MAY 1-8

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200% to 400% more life wear than steel gages
Approximately same cost as plain steel gages
Gaging costs cut 60% or more
No lapping or grinding after HEMCO Process is applied
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Unconditionally guaranteed not to chip or peel

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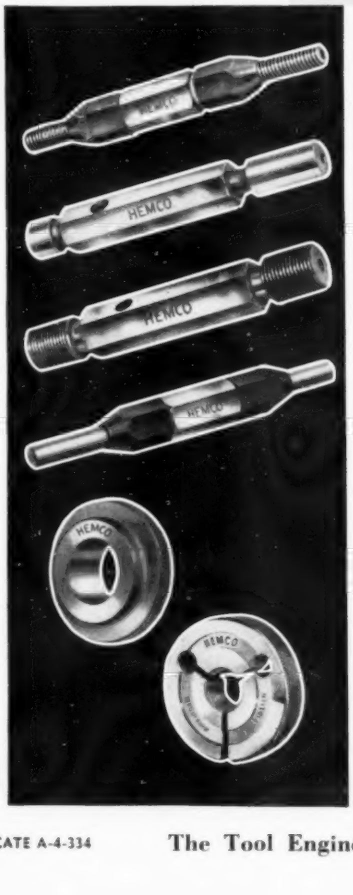
Let Them Write Their Own
Performance Ticket For You



If you have unusual gaging problems, ask us to help on design and quotations.

DISTRIBUTORS: Some fine territories are open. Why not write for information?

THE H. E. MORSE CO.

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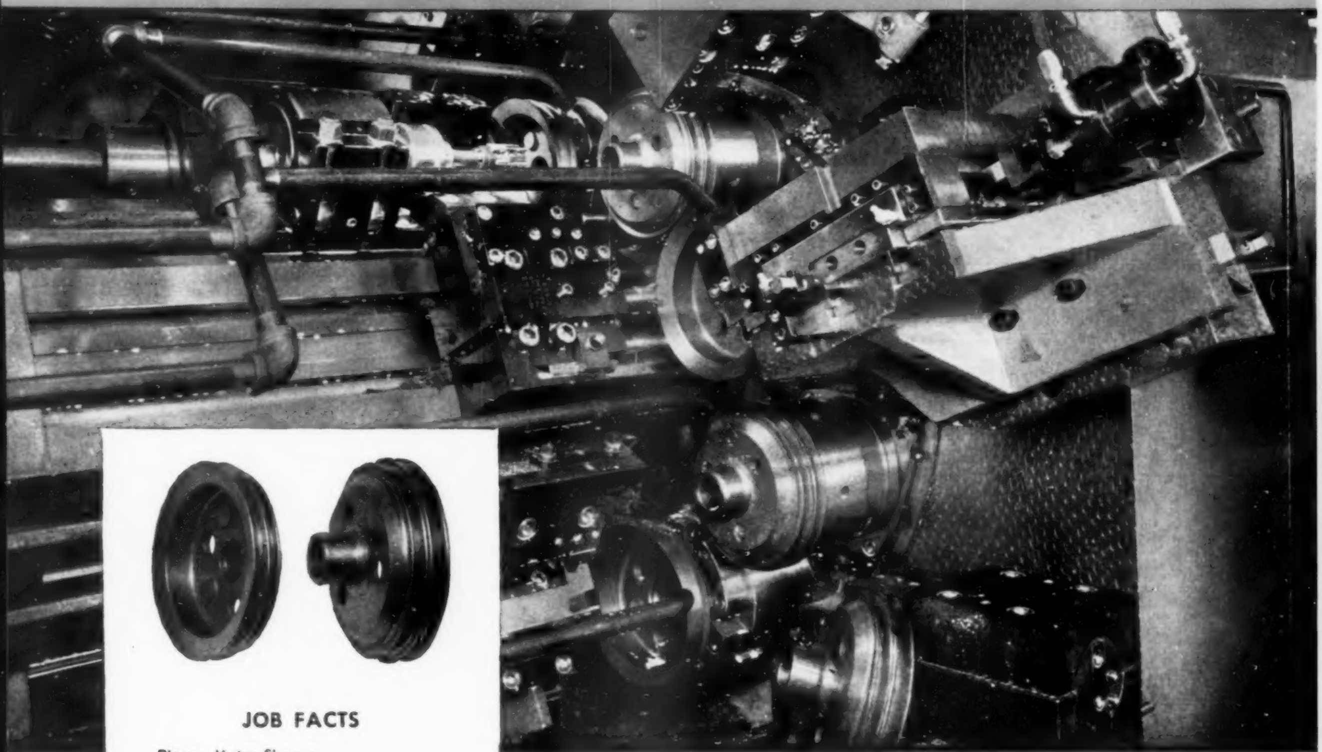
with an

Acme-Gridley

8 SPINDLE CHUCKER...



JOB FACTS

Piece—Motor Sheave

Material—Cast iron $3\frac{1}{2}''$ long, $7\frac{3}{8}''$ diameter

Operations—Machine arranged for double indexing to complete both ends of piece simultaneously. 26 operations (13 on each end) including skiving. Carbide tooling used throughout.

Machine Time—49 seconds

Machine—8 inch 8 spindle Acme-Gridley chucking automatic.

Ask for our representative to tell you more about Acme-Gridley BASIC DESIGN. Meanwhile write for Bulletin CM-44 showing 25 different tooling setups on chucking jobs.

you get these advantages

Maximum production, at lowest cost per piece, is assured because of:

GREATER TOOLING FLEXIBILITY . . . the result of Acme-Gridley sound *basic* design.

DOUBLE INDEXING . . . which lets you finish *both* ends of the piece *at one time*, more accurately, with less handling—as fast as modern tools can take it.

INGENIOUS TOOLING ENGINEERING . . . that comes *only* from COMPLETE LINE experience.

National Acme

THE NATIONAL ACME COMPANY, 184 EAST 131ST STREET, CLEVELAND 8, OHIO

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LET MAGNA repeat these savings

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See These Tools In Action:
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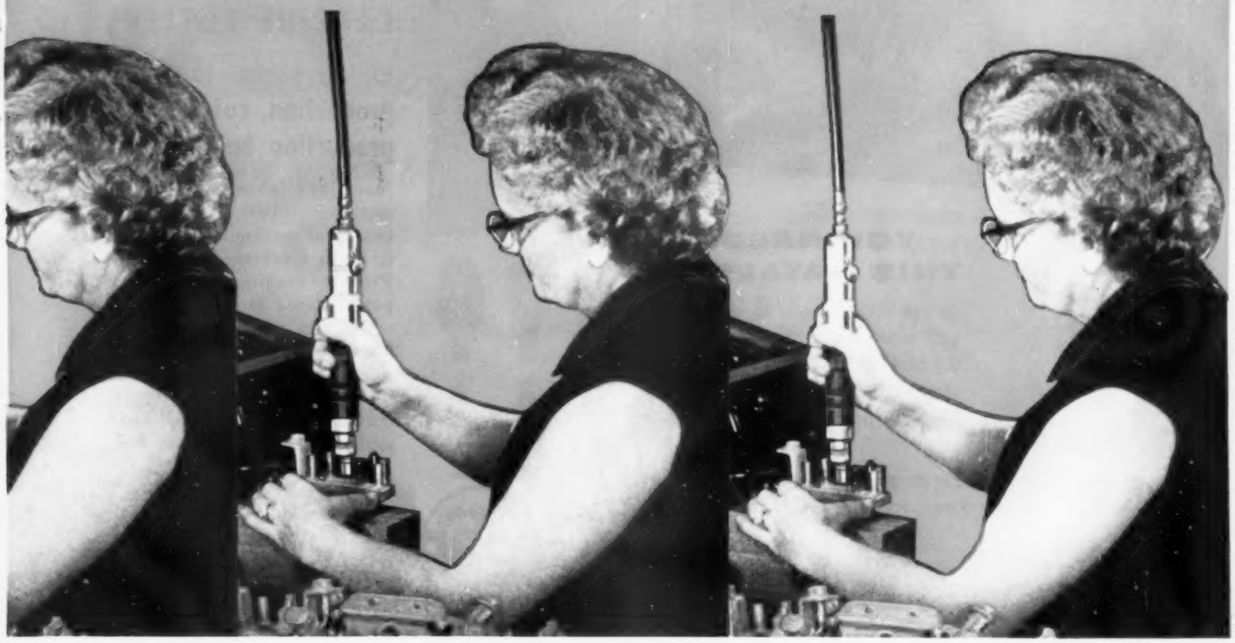
(Cam-tork and Magnamatic)
• Broaching
• Multi-spindle

Breakage of plastic handles was spiralling assembly costs at the Line Material Industries, Zanesville, Ohio. The culprit—overtightened screws which caused a large number of handles to hit the scrap bin daily.

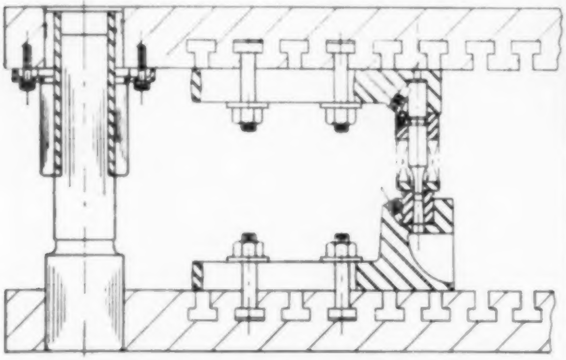
A CP Magnamatic screwdriver was installed in September 1956 and has been saving this company over $2000 a year in spoilage alone. Assembly time has been cut by 12%. The Magnamatic One-Shot Clutch runs each screw to the exact pre-set torque then "shifts to neutral"—virtually eliminating breakage. There's no ratcheting, burred screw heads or damaged work. And the uniformity of the Magnamatic's precision tightening action provides a final product inspection that assures complete quality control...eliminates any need for final hand torquing.

Get the facts first hand! Mail the coupon today for prompt action or detailed information!

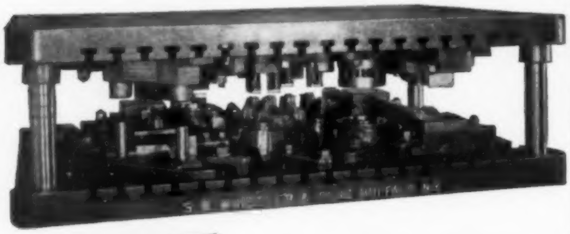


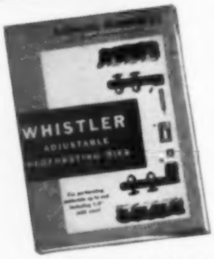
ADJUSTABLE DIES by WHISTLER

• Operate like a single purpose die • Easy to set-up and make changes • Interchangeable and re-usable parts always ready for a new job • Reduce die costs to a new low • Pierce holes in any desired arrangement of shapes and sizes • Precision piercing of materials to ¼" thick steel.



Above: Sectional drawing of a Whistler adjustable punch and die unit assembled in T-slot die set. **Below:** A completely assembled Whistler adjustable die ready for the press.





YOU NEED THIS CATALOG

to see for yourself in dollars and cents what this adjustable die making method can do for your plant. Send for it right now . . . without obligation.

S. B. WHISTLER & SONS, INC.
744 Military Road, Buffalo 23, N. Y.

ADJUSTABLE, MAGNETIC and CUSTOM DIES FOR ALL INDUSTRY
Direct Factory Representatives Located in Principal Industrial Areas

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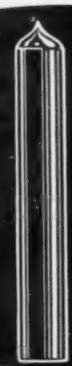

Guaranteed to be full, individual stones, mounted in 7/16 x 6" cold rolled shanks.

CARAT	PRICE	CARAT	PRICE
¼	$2.25	1	$8.25
½	4.00	1½	12.00
¾	6.00	2	16.00

★ These diamonds can be set in any shank to your specification for $1.00 each extra
★ Prompt resetting service

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DISCOUNT 50%
From Standard List Prices

All our products are manufactured in our own plant and are guaranteed for quality, performance, and workmanship.

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Manufacturers of a complete line of diamond tools and wheels
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machine ground CARBIDE CUTTERS

Eight shapes to speed production, cut costs on production burring jobs

Now available from Ford stocking jobbers in a wide selection of cutting head sizes — in both Carbide and H.S.S. Provide continued new tool performance at minimum cost when you take advantage of Factory Regrinding Service. Accurate fluting of original precision machine grinding is maintained. See your Ford jobber or write for catalog 601.

Rotary FORD Tools

M. A. FORD MFG. CO., INC.
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Precision Manufacturer of H.S.S. and Carbide Rotary Cutters Carbide End Mills • Special Tools

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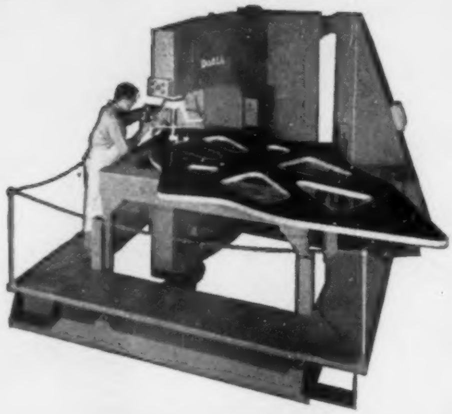
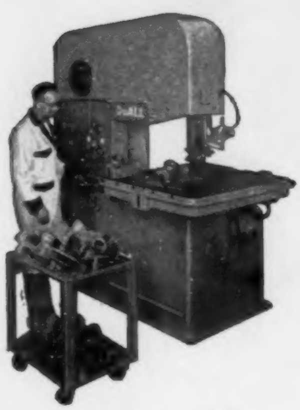


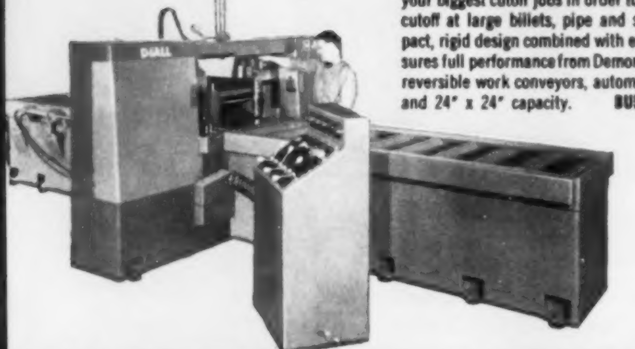


THE BAND MILL answers your need for faster, more economical straight-line metal parting of heavy plate, castings, billets, bars, forgings, etc. Fluid drive work table has two-ton capacity, 40" stroke with smooth, positive feeds down to .030" per minute. Throat 26" with 24" thickness capacity. **BULLETIN No. 57-4.**

REVOLUTIONARY PAN-ARM CONTOUR machine provides a new, low-cost way for machining massive and irregular shaped workpieces. It presents a completely new concept for inside and outside straight-line or contour cutting of work sections up to 20" in thickness. The work remains stationary as the machine moves the saw blade over a 99-square-foot area—cutting in any direction. **BULLETIN No. 56-59.**

CONTOUR-MATICS for sawing, filing, grinding and polishing; cut machining time in half as compared to other methods. Super-fine finish eliminates secondary operations. Introduced with Demon HSS Blades, they give 10 times greater cutting rate and 30 times more tool life. Handle production machining and toolroom work with simplest fixtures: hydraulic power feed table, infinitely variable tool velocity, and coolant system. Available in four models, 16" to 60" throat. **BULLETIN No. 54-782.**

RIGHT NOW! tool for competition

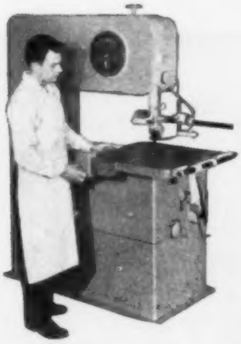


AUTOMATIC POWER SAW Model C-24 is built for your biggest cutoff jobs in order to provide low-cost cutoff at large billets, pipe and structurals. Compact, rigid design combined with extreme power assures full performance from Demon HSS Blades. Has reversible work conveyors, automatic chip removal and 24" x 24" capacity. **BULLETIN No. 58-61.**

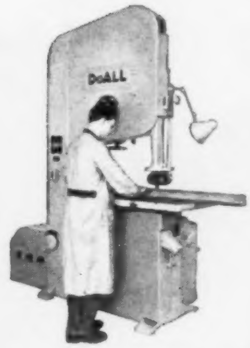
POWER SAW Model C-58 sets world records for fast, automatic cutoff sawing—easily adapted with standard attachments to meet any specific production requirement. Designed expressly for Demon High Speed Steel Blades. Has infinitely variable speeds and 12" x 12" capacity. Also available in Model C-57. **BULLETIN No. 54-804.**

POWER SAW Model C-12 offers accuracy at low cost for the small shops or intermittent production. Ample power and rigidity assure maximum performance from Demon HSS Blades. It is unsurpassed for accurate machining of tough, expensive steels, pipe, structurals, etc. Four speeds, 12" x 12" capacity, and manual control. **BULLETIN No. 58-82.**

◀ What is your cutoff job? DoALL Power Saws will show you how they can be cut faster, cheaper and more accurately than any other machine.



CONTOUR MACHINES for general- or special-purpose sawing, filing and polishing operations. Manually operated and economically priced, they have same rugged, rigid construction, modern design and precision performance as Contour-Matics. Standard features include heavy-duty tilting table, infinitely variable tool speed, and weight-controlled power feeds. Available in 16" to 60" throat and 8½" to 13½" work height capacity.
BULLETIN Nos. 55-38 and 54-782.



ZEPHYR Band Machines for friction sawing of ferrous metals at blade velocities up to 15,000 f.p.m. and high-speed sawing of nonferrous materials. Has rigid, integrated steel construction, power feed tables, automatic brakes and variable tool speeds. Available in four models, 16" to 60" throat capacities. **BULLETIN No. 52-303.**

The setting for unmatched machining versatility and economy today! ▶

with DoALL band machining

one sure way to reduce your metalworking costs!

In plant after plant, DoALL Band Machining answers the critical need for lower cost production. Because the new Demon High Speed Steel® Saw Blades give such outstanding performance, we introduce this new and complete line of machine tools that offer a new production era for band machining.

Now is the time to replace costly chip-by-chip machining methods with the amazing continuous-cutting efficiency of DoALL Band Machining. It provides fastest cutting, greatest versatility, least fixturing and smallest scrap with minimum machine investment.

Whatever your application, DoALL can provide the exact model of band machine you need for greatest efficiency—at prices starting from $845.00. There are machines for handling your biggest or smallest jobs on single or production rate basis. Find out now how one or more units will easily fit into your production picture. Call your nearby DoALL Store. Ask for a free demonstration—conducted right in your own plant.

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TOOL SHOW
May 1-8
in
DoALL's Exhibit Booth No. 604

Your answer to—"Tooling for Competition"

B-51

Ask About Our Lease Plan

DoALL originated the leasing of machine tools. Its successful operation for many years can mean immediate savings to you. All DoALL machine tools can be leased at low rental with purchase option.

DoALL

The DoALL Company,
Des Plaines, Illinois

This is a Typical DoALL Store

NEW XTRA-SAFE

MODERN-MAGIC CHUCKS & COLLETS

These, "the original", Modern-Magic chucks, still contain a solid, one-piece body and shank construction. And now, live-spindle tool changes are made even more foolproof, through the addition of these new extra-safe features. Take a look.

EXTRA WIDE, NO-PINCH LOCKING RING

The new flanged top on the locking ring protects hands from contact with the upper retainer spring and spindle. And its extra width assures that the lower retainer spring will always be covered, regardless of position. No pinched hands!

PROTECTED, WIDE FLANGED COLLETS

Guard against injury when handling collets with greasy hands. You can't drop them, and hands won't ride up into the chuck.

make live-spindle tool changes "on-the-run" - safely!

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PHILADELPHIA '58 MAY 1 TO 8

ASTE TOOL SHOW

BOOTH NO. 1504

THREAD TOOL DIVISION

JONES & LAMSON

JONES & LAMSON MACHINE COMPANY, 518 Clinton St., Springfield, Vt., U.S.A.

New Economy and Speed in Tooling Production for the Airframe Manufacturer with POLYTOOL

Photos courtesy of Arrowsmith Plastic Tooling, Inc., Los Angeles, Calif.

RCI EPOXY PLASTIC TOOLING COMPOUNDS

In the photos above you see a completed plastic stretch die and the laminating build-up stage in its fabrication.

This plastic stretch die has excellent dimensional stability. It is lightweight and was produced fast at low cost.

Reichhold, a basic manufacturer of resins, offers you a full line of epoxy plastic compounds for tool production.

POLYTOOL 2501 (white finish) and **2551** (metallic) are epoxy plastic tooling compounds for casting and laminating applications.

POLYTOOL 2502 (white finish) and **2552** (metallic) are epoxy plastic tooling compounds for gel coat application.

Reichhold supplies low irritation **POLYTOOL HARDENERS** for varying the gel time of these compounds. Reichhold also furnishes POLYTOOL compounds for a 3-component system with which you can vary working properties to meet specific requirements.

Why not investigate the **RCI POLYTOOL** line of plastic tooling materials? It includes not only epoxy, but also polyester, phenolic and polyurethane resin systems. RCI offers you outstanding quality control of these materials.

REICHHOLD

Synthetic Resins • Chemical Colors • Industrial Adhesives • Phenol
Hydrochloric Acid • Formaldehyde • Glycerine • Phthalic Anhydride
Maleic Anhydride • Sebacic Acid • Ortho-Phenylphenol • Sodium Sulfite
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Creative Chemistry... Your Partner in Progress

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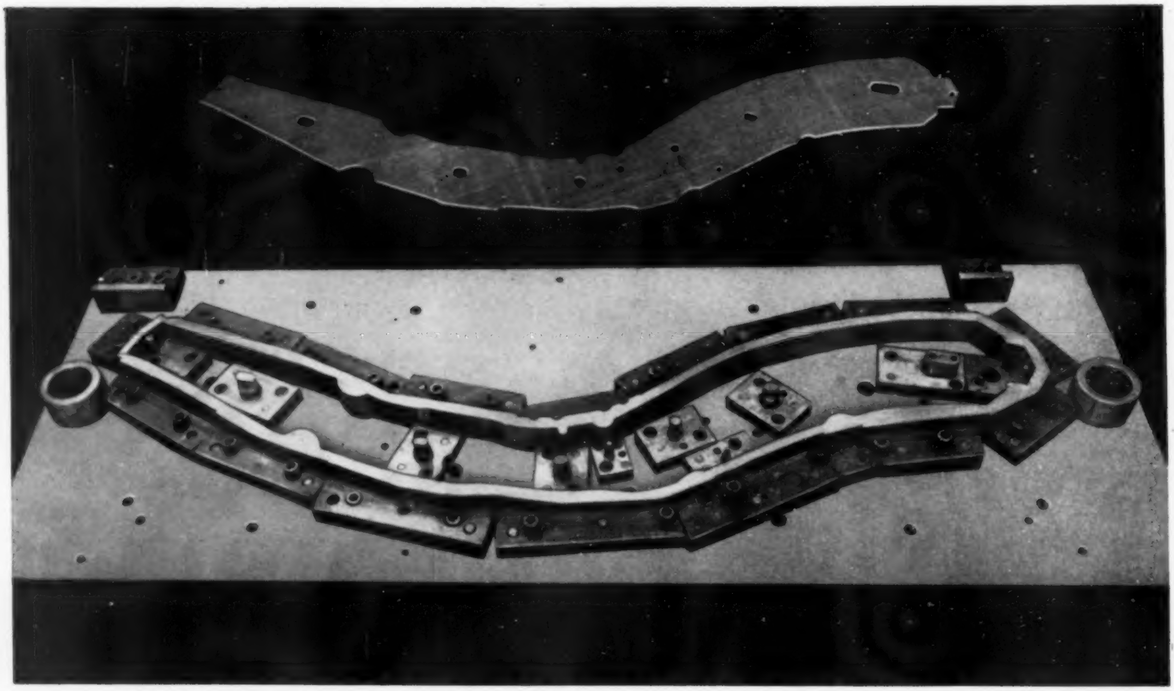


Midland-Ross die made of Uddeholm solid tool steel shapes, with resulting part — similar to die at ASTE Show

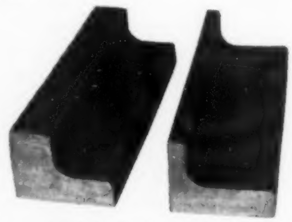
Uddeholm shows how solid tool steel shapes help build better dies

Die At Booth 300, ASTE Show Provides Good Example

Building better dies is getting a boost these days from the use of solid tool steel shapes. Case in point — a blanking and perforating die shown by Uddeholm at the coming ASTE Show in Philadelphia. Incorporated in the design of this die are Uddeholm's standard water-hardening H and J tool steel shapes — used in place of 2½" x 3½" rectangular stock. Midland-Ross Corp., Cleveland Div., one of the country's largest automotive frame manufacturers, uses this die to blank and perforate automobile X frames and component parts. Sheet and plate blanked by the die average ⅛" to ½" thick. On occasion it has also blanked material up to ⅝" thick.

Midland-Ross prefers the Uddeholm shapes because they are *solid tool steel throughout*. Any part of the shape can be used as a working surface. And their greater inherent strength eliminates any of the breathing action often resulting in composite sections. Uddeholm shapes are available, from warehouse stock, in either oil-hardening (SAE O1) or standard water-hardening (SAE W1) analysis. Supplied in 10-12 ft. random lengths, they provide great flexibility in making die sections to a wide variety of forms and lengths. See your Uddeholm sales representative for more information on Uddeholm's complete selection of fine, Swedish-quality tool steels.

Write For Tool Steel Stock List No. 12



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Tool and Die Steels
Specialty Strip Steels

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Do You Waste Thread Ring Gage Life? Are You Using Full Ring Tolerance?

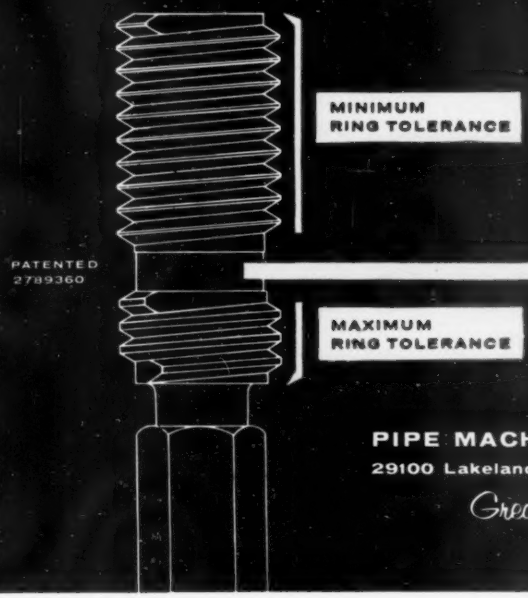
Pipe Machinery Hilo Set Plugs are

The One Sure Way to Tell

Can you be sure your thread ring gages and other adjustable instruments for inspection of male threaded parts are not being scrapped before you have used the tolerance to which you are entitled? If you're employing conventional setting plug gages that depend on the human yardstick . . . the individual operator's sense of feel and snug fit . . . you can't. Chances are you're wasting ring life!

Pipe Machinery's new more accurate Hilo Set Plugs are designed with two sections having different pitch diameters but identical lead and angles. The front end is made to the extreme low limit of prescribed ring gage pitch diameter tolerance—the back end to the high limit. There's no guesswork in sizing and setting. If the smaller end of the plug enters and the larger end is held out, the ring is the proper size for the tolerance specified. You use all the life built into your adjustable thread gages . . . reject them instantly and positively when the ring is out of limits.

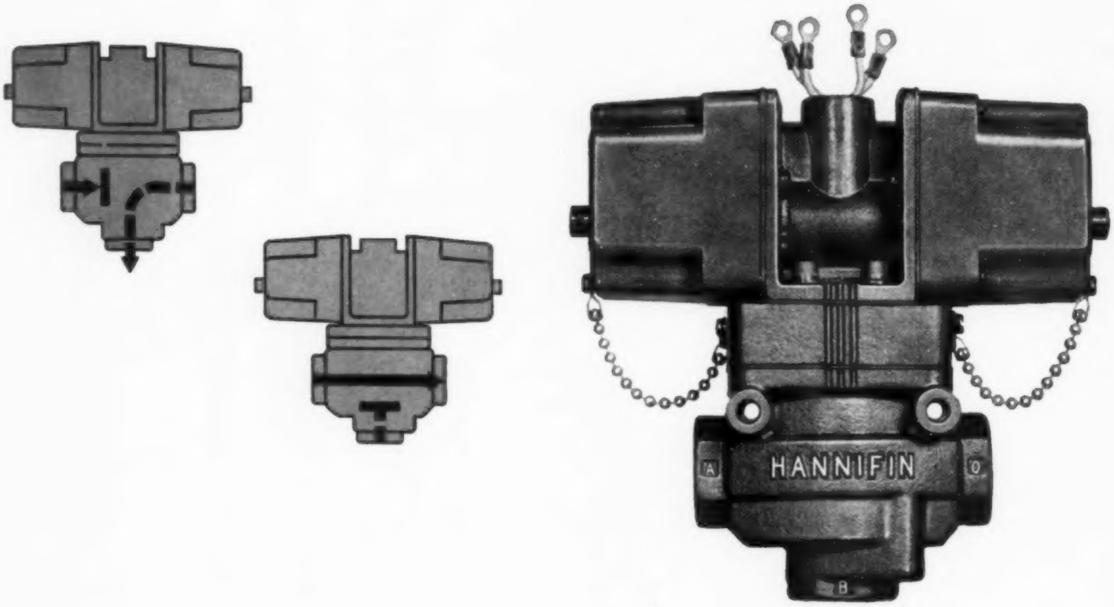
Write for additional information.



THE PIPE MACHINERY COMPANY
29100 Lakeland Blvd. · Wickliffe, Ohio
Greater Cleveland

Setting the pace for automation

...Hannifin valves



Automatic processes call for speed, sensitivity and flexibility in directional air control. Above all, they demand dependability. That is why so many valve users find it pays to choose Hannifin.

Every feature that contributes to dependable performance has been incorporated in Hannifin air control valves. This dependability is the result of never-ending research and development.

In the broad Hannifin line, you will find valves with new exclusive features...valves for practically any kind of automatic sequential operation. All are simple in design, with few and easily replaceable parts.

AIR CONTROL

HANNIFIN

VALVES

For this complete catalog showing all the Hannifin directional air control valves, write to Hannifin Company, 519 South Wolf Road, Des Plaines, Illinois. (Hannifin Company is a division of Parker-Hannifin Corporation.)

STERLING TRAY COURTESY TIFFANY AND CO., NEW YORK

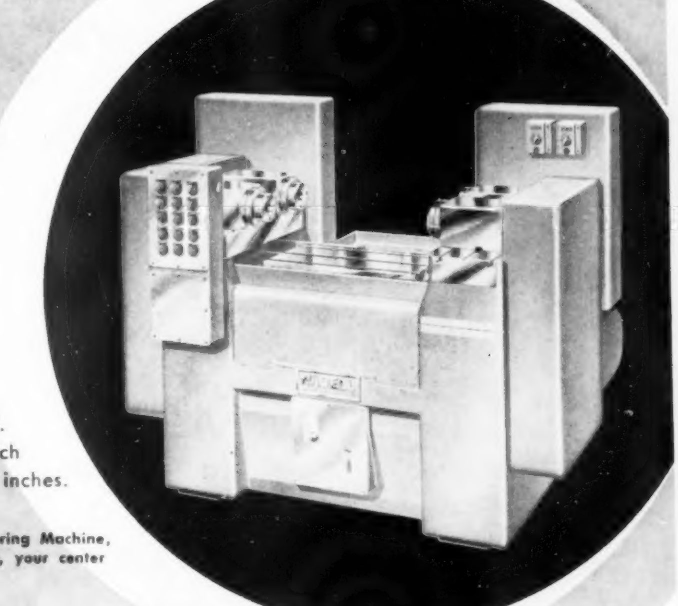
1958 ASTE TOOL SHOW · CONVENTION CENTER · PHILADELPHIA

MAY 1 THROUGH MAY 8

HIGH PRECISION MACHINE TOOLS and MEASURING EQUIPMENT

NEW IDEAS

IN MACHINE TOOLS BY WADELL



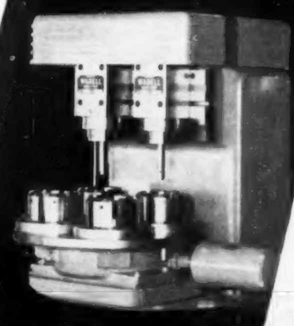
HORIZONTAL PRECISION BORING MACHINE

The new additions to the Wadell line are the versatile (Model HBM) **Horizontal Precision Boring Machines.** Single and double end. These machines have electro-hydraulic feeds, conform to J.I.C. specifications and include design features which minimize thermal distortion. Table stroke is 15 inches.

See the "Retrakto-matic", the new **Horizontal Precision Boring Machine**, and the exclusive VBM at the Wadell Booth No. 1816, your center for High Production Machine Tools.

VERTICAL BORING MACHINE

The Model VBM, Vertical Precision Boring Machine represents an entirely new idea in high production, high precision machine tools. The vertical construction affords convenience of handling work-pieces and makes possible the use of automatic indexing tables. This type of machine is very versatile and can be adapted to a multitude of machining requirements. Grinding, milling and contouring operations have been applied to the basic machine.

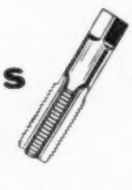


"Retrakto-Matic"

The "Retrakto-matic" Boring Bars offer an inexpensive means of automatically retracting the cutting edge of a rotating bar. As a result, boring out on the return stroke, to avoid a drag line, is eliminated. You get faster cycles and increased accuracy. These boring bars can be adapted to many makes of hollow boring spindles.

WADELL EQUIPMENT CO.
159 TERMINAL AVE., CLARK, NEW JERSEY

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-4-351

BAY STATE TAPS  **and DIES!** 

On the nearby shelves of your Industrial Supply Distributor

Your local Industrial Supply Distributor . . . is your neighbor • knows your needs, product-wise and service-wise • knows proper tool applications • stocks types and sizes to suit area demands • stocks locally, delivers promptly • and aids your community

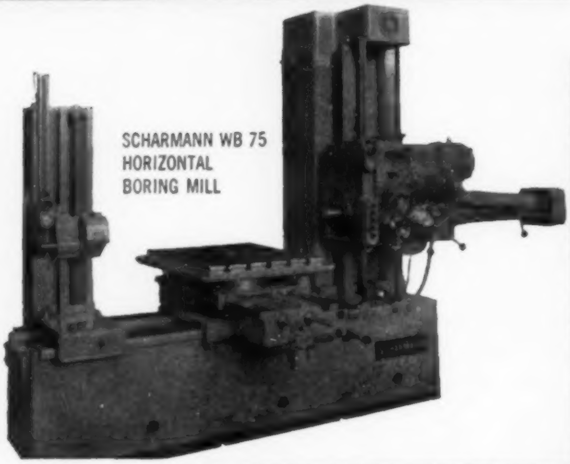
BAY STATE TAP & DIE COMPANY • MANSFIELD, MASSACHUSETTS

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-4-352

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-4-353

See SCHARMANN at the ASTE Show

BOOTH 1015 • CENTRAL HALL



PROVEN COST-CUTTING

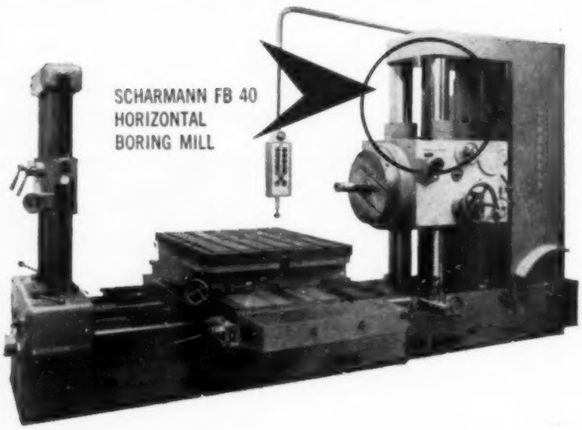
So much boring mill for so little! If you think you can't afford a universal boring mill in your plant or machine shop, the Scharmann WB 75 will be a most pleasant surprise. It will also show you the key to that perplexing problem — How do we increase flexibility and decrease costs at the same time?

If you have "orders from the top" to cut down on equipment and personnel without cutting down on versatility and workmanship, this machine is definitely for you.

UNIQUE HEADSTOCK SUSPENSION

"See to appreciate" was never so true as with this unique design. Its radical departure from standard side-head suspension can mean a radical change in your evaluation of horizontal boring mills for your plant's requirements. By suspending the headstock between two round steel columns, Scharmann has combined in one boring machine the rigidity of a production mill and the versatility of a precision coordinate mill.

A General Electric Speed Variator provides smooth, controlled, variable speed, ultimate DC drive flexibility.



Write for information, literature, or quotation.

SCHARMANN MACHINE CORPORATION
337 Boulevard of the Allies • Pittsburgh 22, Pa.
Manufacturers of Boring Mills Since 1884

CONTROL is first! Now—one step static control with switching reactors

No wonder Nikita looks worried. CONTROL has taken the strain off American industry's pocketbook by cutting the cost of static control.

American engineers who want to make free use of power switching guided by digital logic can now take over, because CONTROL's standard line of switching reactors give freedom of design and economy never before available.

First, one-step static control with switching reactors is so easy to operate it can be put to work in everyday sequencing and switching problems involving either a-c or d-c loads. Auxiliary equipment is eliminated by the basketful. Gone are all the preamplifiers, special power supplies, information-sorting single purpose logic units, and power switching relays. CONTROL's one-step switching reactor does most of the job by itself.

Second, these units, in four nominal volt-ampere ratings of 15, 75, 150 and 300, have no relay contacts or moving parts to replace. Switching is by impedance change. Install them and forget them—no wear, no maintenance.

Third, each CONTROL reactor performs all logic functions —AND, OR, NOT, MEMORY and TIME DELAY—through its multipurpose control coils. Signal source is derived typically from limit switches, push buttons, or photo-cells.

Fourth, each unit has a 10,000:1 switching ratio under nominal supply voltage conditions. High inrush currents are handled without difficulty.

To learn how CONTROL reactors work, and how they'll fit your need for completely dependable, low-cost, versatile static control, write—and see why Nikita looks worried. *CONTROL, Dept.* T-46, *Butler, Pa. U. S. A.*

Reliability begins with CONTROL

A DIVISION OF MAGNETICS, INC.

*Expurgated translation. Heavens-to-Betsy!

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-4-356

Talking About Die Sets

with

Phil Marsilius

Executive Vice-President

The Producto Machine Co.

How to Select and Order a Catalog Die Set—Do you always order the die set you *really* need for the job…or do you overlook a specification which results in your having to "make do" with the set you ordered or lose time by having to re-order?

Once again, we feel that a simple and basic practice should be emphasized because our daily experiences show that even the most painstaking individual occasionally overlooks one or more factors in preparing to place an order.

Here is our suggested check-list for selecting and ordering a catalog die set:

1. Lay out the die. Allow sufficient area for feeding devices and auxiliary stock guides that may be required. Determine also what areas must be left clear for part ejection or scrap.

2. Determine type of set you need—rear two-pin, four-pin, center-pin, etc.—according to tolerances and construction of die.

3. Place layout on templates for the type of die set you have chosen. Select die area that best meets the limits established in Step 1.

4. Select material for die set—semi-steel, all-steel or combination—based on the die's strength requirements.

5. Select thicknesses of punch and die holder in line with strength requirements and allowable press shut height.

6. Determine length of guide-pin required*, based on length of stroke or ram clearance.

7. Determine type and length of bushing and material from which it should be made, based on accuracy, speed of operation and required life expectancy of die.

8. Select shank diameter for the press on which die will be run.

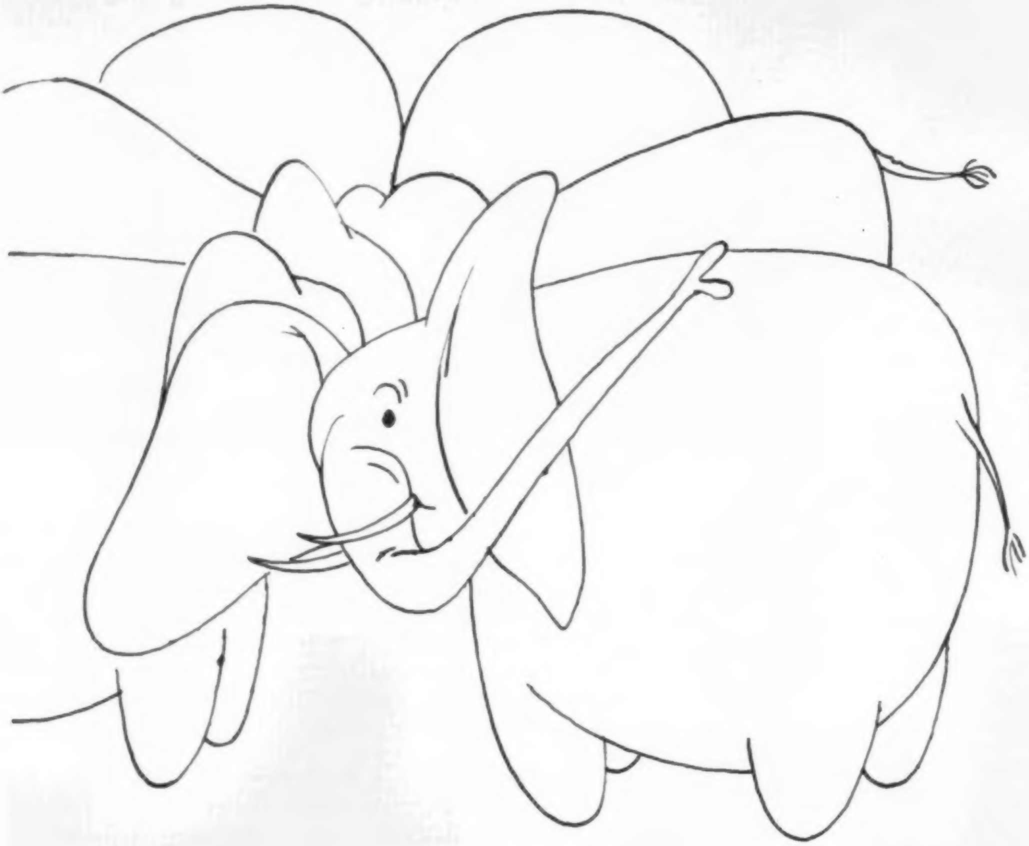
9. Choose grade of precision required—Master or Commercial—based on tolerances and number of pieces to be produced.

10. Order die set which meets most closely the above requirements, making certain that *all* ordering information is included: Catalog number and quantity; Master (Precision) or Commercial grade; length of guide pin; type of bushing; diameter of shank or "no shank"; how to ship. Keep in mind that special thicknesses of punch holder and die holder can also be ordered if required.

Of course, you may not find it possible to check these points in the exact sequence presented. However, if you will make it a habit to use this check-list for each die set you need, you can avoid making costly errors in ordering.

*"L" dimensions pertaining to pin length as shown in die set catalogs refer to distance from bottom of die holder to top of pins. They do not necessarily apply to actual guide pin lengths.

something big on the move

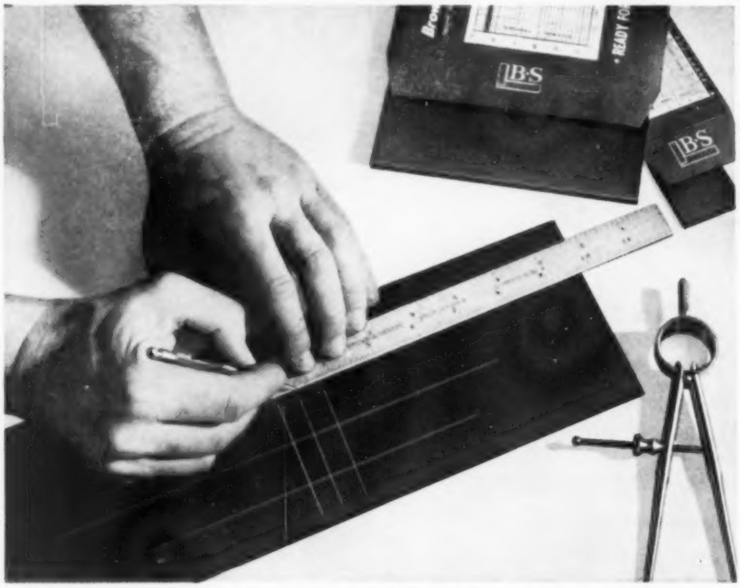


ANOTHER ENGINEERING FIRST FROM T-J TOMKINS-JOHNSON

Don't Miss It at the ASTE Show, May 1-8, Booth 1423

Precision Tool News

No. 5 B·S REPORTING NEW DEVELOPMENTS AT BROWN & SHARPE'S PRECISION CENTER



"Ready Mark" Flat Stock is Pre-Colored for Immediate Layout

Brown & Sharpe now offers a complete line of "Ready Mark" precision ground tool steel that comes to you coated with a smooth blue finish, all ready for scribing. The blue finish prevents rust, eliminating the need for "greased" stock; serves as permanent identification. This pre-colored stock saves about 5-minutes degreasing, bluing and drying time each time it is used.

The stock itself is the same free-machining, easy and full-hardening quality steel that is used for regular B&S Oil Hardening Precision Ground Flat Stock, preferred the world over. All pieces are 18" long, conveniently packaged in easily-identified envelopes (smaller sizes) or cartons . . . with complete heat-treating instructions and analysis.

B&S Direct Reading Micrometer Speeds Measurements

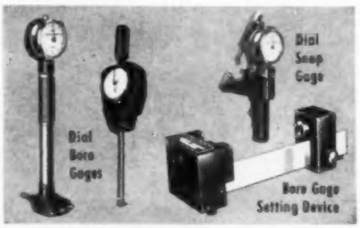
Numbers appearing in plastic windows on the revolving thimble of Brown & Sharpe's new D. R. M. 200 micrometer shorten reading time by indicating .001ths directly in units of .005ths. Individual .001ths and .0005ths are then read easily from the thimble—.0001ths from widely-spaced Vernier graduations on the non-revolving sleeve. There is no possibility of "twenty-five thousandths" errors.

Announcing New B & S Dial Bore & Dial Snap Gage Lines

Brown & Sharpe Dial Bore Gages quickly determine to .0001" whether bore diameters are within tolerance . . . disclose bell-mouth, out-of-round, barrel-shaped and other bore conditions. Frictionless action provides high repetitive readings.

Seven sizes cover from 1/8" to 13", with no spacers or shims required. Fixed-pin equalizers assure positive centralizing in hole; handles are insulated against hand heat; and an easy-reading AGD indicator with adjustable bezel provides consistent accuracy. Available with tool-steel points in carrying case. Carbide or diamond points available.

Easy-to-use B&S Bore Gage Setting Devices are perfect companions that simplify setting of the Dial Bore Gages . . . eliminate the need for inventories of ring gages. B&S Dial Snap Gages, offering similar advantages of speed and accuracy for checking outside diameters of 0" to 4", are also available.



Ask Your B&S Distributor to show you these tools

Brown & Sharpe precision tools are available to you quickly, at factory prices, through your nearby B&S Distributor. Call on him for experienced help in any of your precision tool needs. Brown & Sharpe Mfg. Co., Providence 1, R. I.

PROGRESS IN PRECISION FOR 125 YEARS

Brown & Sharpe B·S

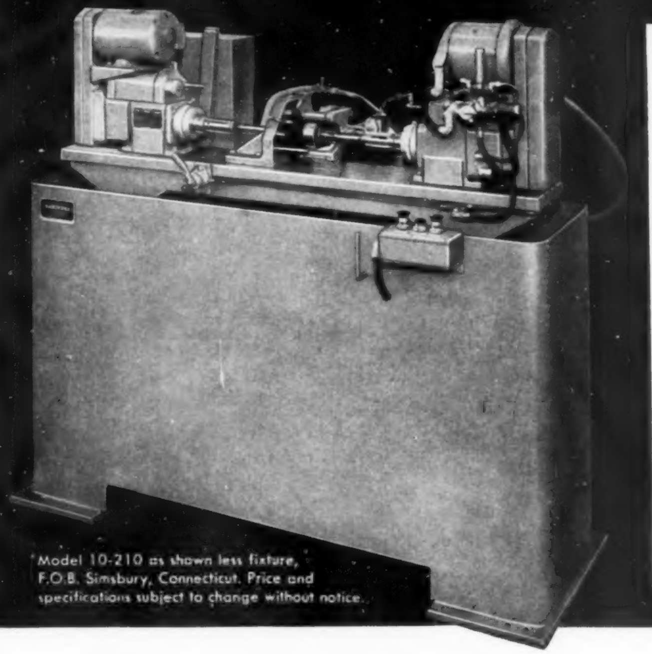
'58
BOOTH 824

PRECISION TOOLS AND GAGES • MILLING, GRINDING AND SCREW MACHINES • CUTTERS • MACHINE TOOL ACCESSORIES • GEAR, VANE AND CENTRIFUGAL PUMPS

new

HARTFORD DOUBLE END MACHINE

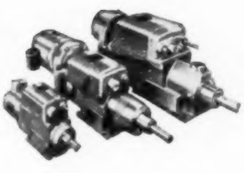
$3,565* Complete



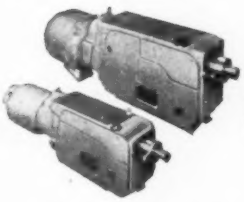
*Model 10-210 as shown less fixture, F.O.B. Simsbury, Connecticut. Price and specifications subject to change without notice.

- Opposed operations simultaneously
- Quick change of stroke, feed rate, spindle speed and unit position
- Handles parts up to 28" long
- Available with manual or automatic interlocked cycle
- Coolant tank, coolant pump, chip pan and coolant troughs integral with base
- Drill capacity to 5/16" in mild steel with 19-150 Unit
- Tapping capacity 3/8" with a maximum stroke of 1½"
- Use with small index table, manual or air clamp fixtures, hopper load devices or vibration feeders
- Adaptable to multiple spindle head applications
- Performs two operations per hole with index table
- Inexpensive, fast, flexible centering operations
- Available as basic machine — completely tooled or as separate components

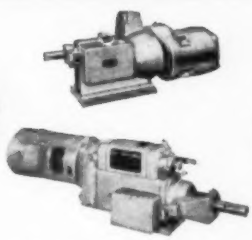
Rectangular Bases — 8" x 60" finished mounting pad accommodates a variety of drilling, boring or tapping units. Coolant tank with pump mounting flange, drain port, chip pan and large coolant troughs included. Adaptable to small index tables, air clamps or other part locators.



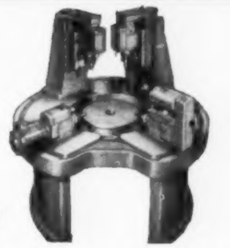
Automatic Drilling and Tapping Units — The Hartford Model 19-150 Quill Type Drill Unit is ideally suited as a working unit on the Double End Machine for production drilling, tapping, reaming, spot-facing, centering, milling, chamfering and countersinking. Other Hartford Units can be readily adapted also.



Automatic Cam Feed Drilling Units—Two models of these mechanical feed units are available. Designed for use with multiple head as well as single spindle applications, these electric clutch units are compact, dependable and fast cycling. They provide positive accuracy on long run jobs.



Automatic Lead Screw Tapping Units—No. 22 unit, above, features lead change through gearing from master lead screw. No. 19-175 unit, below, features variable quick advance stroke before starting lead screw spindle.



Other Hartford standard basic components including circular bases, straight post columns, tunnel columns and unit adapters can be combined with standard Hartford drilling and tapping units for assembly into production machines such as the 65" horizontal indexing machine shown above.

HARTFORD Special

Hartford also makes automatic Thread Rolling Machines, Special Machinery and the world famous Super-Spacer.

Machine Tool Division
THE HARTFORD SPECIAL MACHINERY CO.
2804 Homestead Ave., Hartford 12, Conn.

Send me complete information on Model 10-210 Machine and other machine components.

Name________________ Title________

Company________________

Street________________

City__________ Zone____ State________

Webber Gage Blocks
Insure the Accuracy Essential To Mass Precision Production
Making Webber Gage Blocks is a science—a combination of human skill and the world's finest mechanical and laboratory equipment, both highly specialized. Only with such a combination can gage blocks be made to meet the high standards which Webber steadfastly maintains. Webber can fill your every gage block need, with the most complete line of gage blocks and related accessories.
STANDARD STEEL BLOCKS 84-43-38 Block Sets
"THIN BLOCK" Gage Set 30 Blocks
THE NEW WEBBER OPTICAL HEIGHT GAGE
Micro Accurate Vertical Measurements up to 61 inches.
SQUARE Gage Blocks
In Standard Steel and CROBLOX (solid chrome carbide)
In 88, 85, 84, 81, 36, and 34 Block Sets
Accuracies, both steel and Croblox, "B" +.000006 −.000002 "A" +.000004 −.000002
Illustrated — Set No. 88A with Accessories
See Us at the ASTE Tool Show Booth No. 302
"CROBLOX" GAGE SETS
Solid Chrome Carbide 82, 33, 36 and 14 Block Sets
HEAVY DUTY GAGE SET 84 Blocks
ANGLE GAGE BLOCKS
Two types—"Laboratory Master" and standard steel. ¼ second and 1 second accuracy.
WEBBER ACCESSORIES—permit using gage blocks directly as snap or ring gages, scribers, and with a base block, as a height gage.
WEBBER TEMP-CHECK
Essential wherever accurate control of temperatures is a must. Measures liquids, gases or solids. 4 Models.
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12908 Triskett Rd. • Cleveland 11, Ohio
LARGEST EXCLUSIVE MANUFACTURER OF PRECISION GAGE BLOCKS

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-4-365

AUTOMATIC... stroke lengths infinitely adjustable to 6" ... drills up to ½" holes.

PAR-A-MATIC ... 7 speeds ... stroke and thrust adjustable ... ¼" heavy duty capacity.

BANT-A-MATIC ... 4 speeds ... for portable or fixed mounting ... ⅜" heavy duty capacity.

MIDG-A-MATIC ... only 1" in diameter, 10⅝" overall ... ⅛" holes and under.

Sizes are to relative scale.

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with ARO DRILLS

AUTOMATIC DRILLING at LOWEST COST ... because it's ALL AIR operated!

SINGLE OR MULTIPLE SET-UPS ... widest range of applications.

FEWER MAN HOURS ... greater output ... higher quality.

CHOICE OF 4 precision-made drills ... Aro dependability.

WRITE for complete literature. See your Aro distributor for help in planning multiple installations.

SEE US at BOOTH 1810 at the 1958 ASTE SHOW

THE ARO EQUIPMENT CORPORATION
GENERAL OFFICES—BRYAN, OHIO
Plants at Bryan and Cleveland, Ohio
Aro of California, 3141 S. Grand Ave., Los Angeles 7, Calif.
Aro Equipment of Canada, Ltd., Toronto 15, Ontario • *Offices in All Principal Cities*

ARO AIR TOOLS
Also ... AIR HOISTS ... LUBRICATING EQUIPMENT ... AIRCRAFT PRODUCTS ... GREASE FITTINGS

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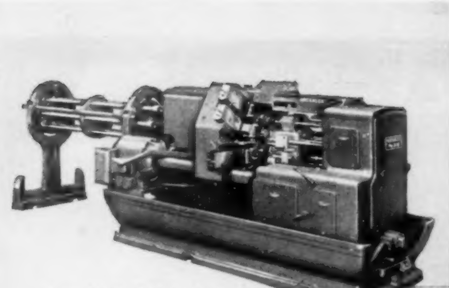
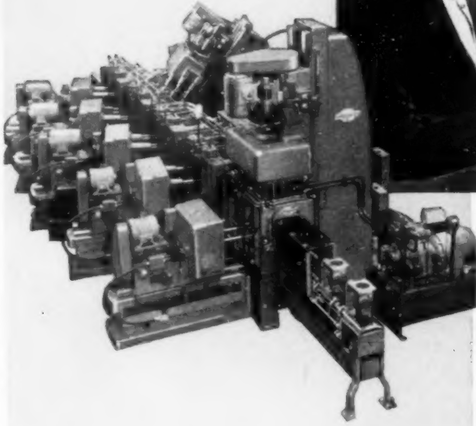


Greenlee Six-Spindle Automatic Bar Machine.

GREENLEE OFFERS

A PROFIT-MAKING INVESTMENT IN HIGH-PRODUCTION MACHINE TOOLS

Greenlee 22-Station Automatic Transfer Machine for machining transmission cases.



Greenlee creative thinking, Greenlee engineering and Greenlee experience combined with that of your own engineers will help you "produce more at lower cost."

Ideas, engineering, experience and facilities of Greenlee Bros. & Co. develop improved methods and machines for greater and greater productivity of future models.

Greenlee's adequate facilities expedite the transition from production ideas to production machines . . . a profit-making investment at work in your plant.

Greenlee 10-Station Automatic Transfer Machine.

GREENLEE STANDARD AND SPECIAL MACHINE TOOLS

- Multiple-Spindle Drilling and Tapping Machines
- Transfer-Type Processing Machines
- Six and Four-Spindle Automatic Bar Machines
- Hydro-Borer Precision Boring Machines

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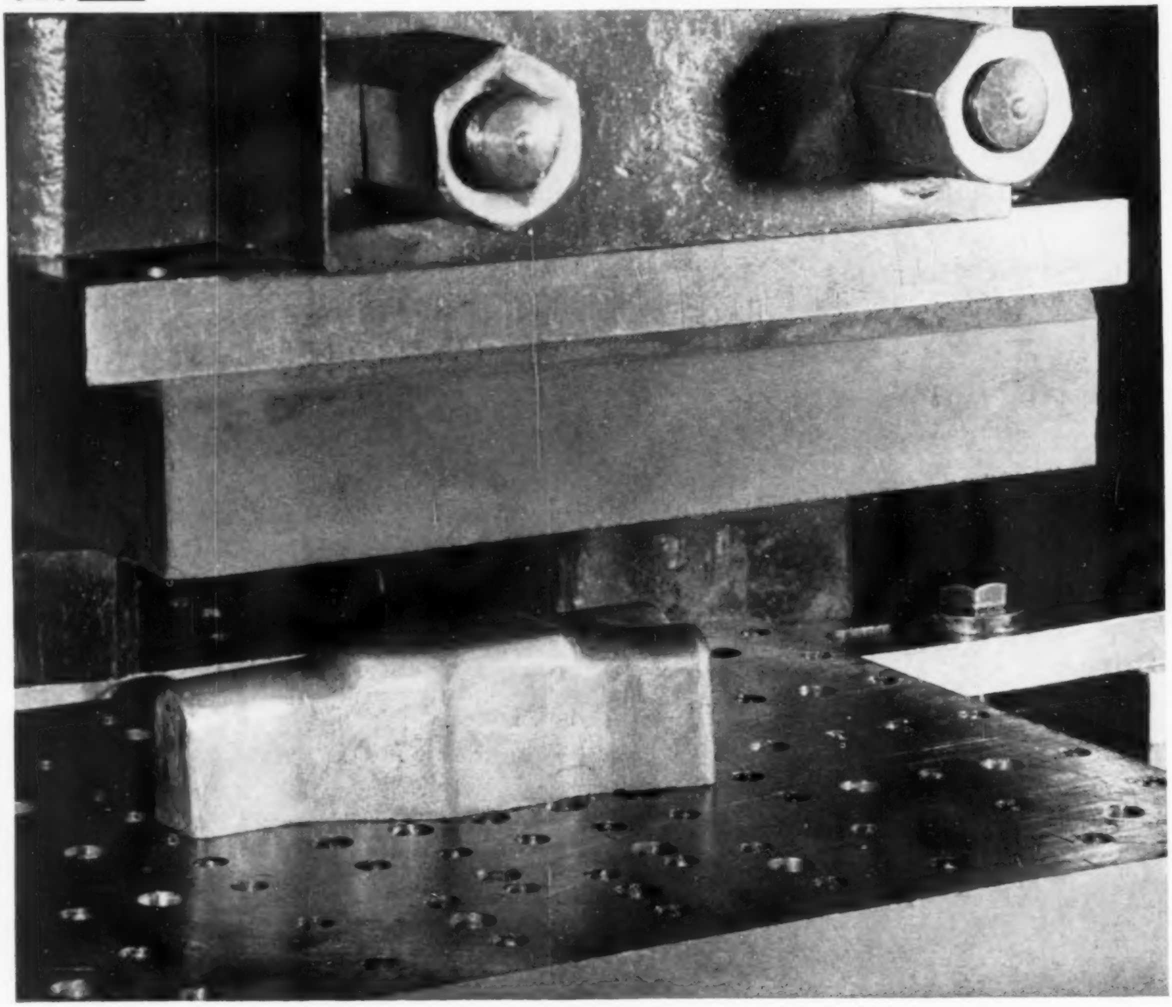
PRODUCTION MACHINERY GREENLEE

GREENLEE BROS. & CO.
1984 Mason Ave.
Rockford, Illinois



Resin die shakes off 85-ton punches!

Tough 3M Brand compound cuts short-run metal-stamping costs

The die is cast for real economy in short-run metal-stamping operations—even in cold roll, complex-contour steel stampings! With new 3M Brand Tooling Compound 113, you can make low-cost dies for punch and die presses up to 85 tons.

This tough, steel-based resin compound has extremely high impact strength; performs at the same production rates and efficiency as do steel dies. The result: economical tooling-up is practical for the first time for many short-run metal-stamping operations, or fabricating prototypes.

Tooling Compound 113 actually cuts tooling costs from 50% to 90%, compared to the costs of ordinary methods. The two-part system results in simple handling, fast drying and curing . . . all adding up to important savings in both time and material.

There's no more weighing and mixing, and you can return what material you don't use to its can. Pot-life and toxicity problems are eliminated. Preforms are fabricated from the treated steel powder, dried to good "green strength," then set in a pan of liquid resin for impregnation and cure.

Look to 3M Brand Tooling Compound 113 for top performance and economy on short runs—in the thousands! For full data, write: *3M Company, Dept. WS 48, St. Paul 6, Minnesota.*

HASTINGS CHEMICAL DIVISION • **CHEMICAL PRODUCTS GROUP**

MINNESOTA MINING AND MANUFACTURING COMPANY

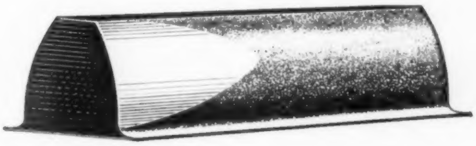
. . . WHERE RESEARCH IS THE KEY TO TOMORROW

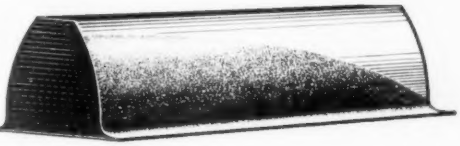
3M COMPANY

Hard Gear Honing .... GIVES YOU BETTER GEARS AT LESS COST

QUICK GEAR INSPECTION

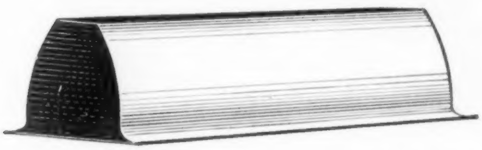
One quick pass with a Red Ring honing tool cleans up the teeth or immediately reveals heat-treat distortions, thus indicating corrective adjustments in the gear forming processes.





CORRECTION OF HEAT-TREAT DISTORTIONS

Minor distortions in tooth profile, helix, index and runout are corrected in from 15 to 60 seconds of honing time.

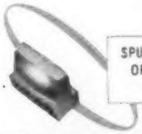


IN ADDITION

Gear honing provides:

- The Lowest Cost Remedy for Nicks and "Hickies"
- Improved Tooth Surface Smoothness
- Overall Sound Improvement

For Quality Gear Production, write for Bulletin H57-2 which gives the full story on Red Ring Hard Gear Honing.



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ORIGINATORS OF ROTARY SHAVING
AND ELLIPTOID TOOTH FORM

NATIONAL BROACH & MACHINE CO.

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WORLD'S LARGEST PRODUCER OF GEAR SHAVING MACHINERY

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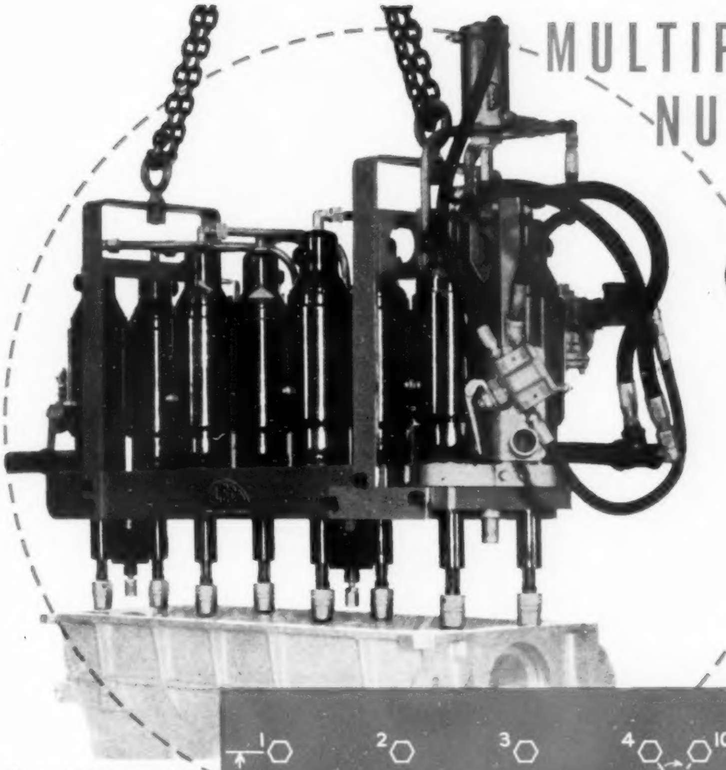
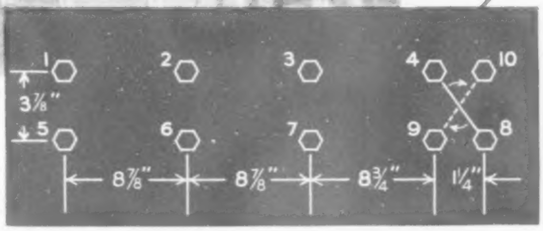
MULTIPLE-SPINDLE NUTSETTER

Custom-Built by Cleco



Cleco 8-spindle nutsetter with special indexing feature to handle 10 bolts. Inlet air pressure is regulated and each drive motor is equipped with a metering valve backhead. Torque variation in the unit is held to no measurable difference.



Cap-bolt pattern for truck engine. Operation one runs bolts 1-8. Operation two completes the assembly.

Cuts rundown time on Bearing Cap Bolts in Half...reduces Torque Inspection from 100% to Spot-Checking!

A leading heavy equipment manufacturer eliminated a production bottleneck and obtained unparalleled uniformity of torque with the pneumatic nutsetting machine shown above.

This machine runs down main bearing cap bolts on a truck engine in less than half the time formerly required using an impact wrench. And the pre-regulated torque on each bolt has proven so invariable that the 100 per cent torque inspection formerly required has been reduced to occasional spot inspections!

Development of a multiple for this particular application required the ingenuity typical of CLECO engineers. Two pairs of bolts on the rear main bearing cap are spaced too closely to be run by four nutsetting motors of the size meeting torque requirements (see diagram). CLECO solved this knotty problem by mounting the two end motors on a special index plate. After the simultaneous rundown of bolts 1 through 8, air pressure is released on the end units and they are repositioned with one movement for rundown of bolts 9 and 10, while the remaining units are idle. This indexing feature permits a single nutsetter to do the work of two.

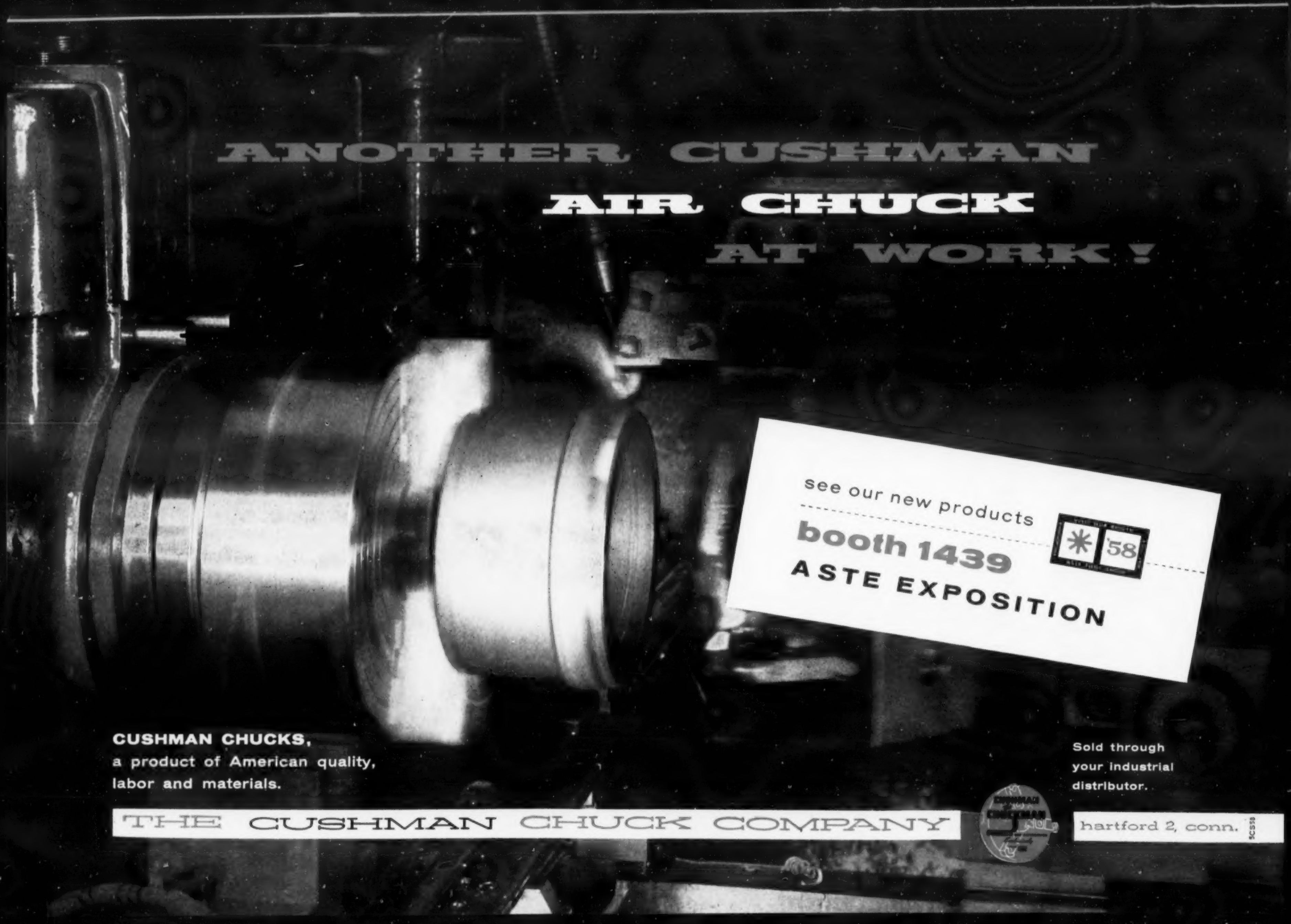
This machine joins a long list of other custom-engineered multiple-spindle units — using standard, proven CLECO Air Motors—which have quickly paid for themselves by effecting tremendous economies in high-volume assembly and disassembly operations. A CLECO multiple can be designed to do the same for you, whether your application calls for two driving spindles or 24, or more.

See Cleco Multiples at the ASTE SHOW, Booth 1871, May 1-8, 1958

CLECO AIR TOOLS

Write for new Multiples Brochure MS-358 or consult CLECO engineers on your specific assembly problems!

Division of REED ROLLER BIT COMPANY
P. O. BOX 2119 • HOUSTON 1, TEXAS
IN CANADA: Cleco Pneumatic Tool Company of Canada, Ltd. 927 Millwood Road, Leaside (Toronto), Ontario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a product of American quality,
labor and materials.
Sold through
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THE CUSHMAN CHUCK COMPANY
hartford 2, conn.
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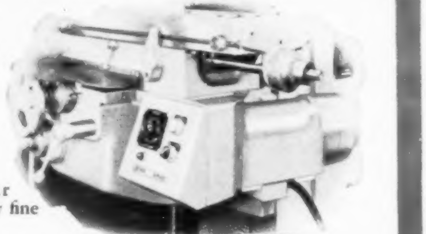
Eventually you'll buy a GORTON MASTERMIL

here's why

DYNA-DRIVE
"The Torque-Thinking" Table Feed

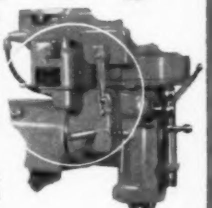


"Feels as it feeds" . . . automatically adjusts for exact amount of torque required. "Thinks while it works", compensates electronically for variations in density, hardness, molecular structure of materials. Result: Superbly fine finish, longer cutter life.

UNIVERSAL SPINDLE HEAD

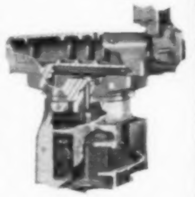
2 HP dynamically balanced motor with belt and gear train provides wide range of speeds from 80 RPM to 5,600 RPM. Head swivels 90° left or right, head, ram and turret rotate 180°. Cross movement 14 inches. Push button starting.

DOWN FEED INFINITELY VARIABLE



Feeds may be varied infinitely from 0" to 5" independent of spindle speeds. High efficiency belt drive. Direction and rate of feed separately controlled.

PERMANENT ACCURACY BUILT-IN

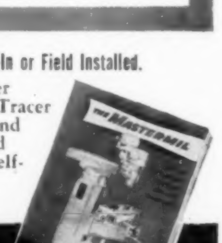


Distortion is prevented by extra heavy one-piece column cast with over-size ribbing . . . extra heavy alloy steel turret clamping bolt (1⅜" dia) with 3-point clamping action . . . heavy dovetail way full length of vertical column face . . . extra large table, knee and 24" saddle (2" longer than table travel) . . . square lock bearings with long, narrow guide between knee and saddle . . . positive locks . . . extra heavy feed screws . . . bearing surfaces hand-scraped.

Complete Versatility Through Attachments Built-In or Field Installed.

Among such equipment is, Trace-Master Hydraulic Tracer Control, Duplicator Tracer Head and/or Table with base, saddle and table in one unit, 6" Raising Block, End Measuring Rods and Dial Indicators, Self-Contained Coolant System.

Write for Bulletin 2699-2604



GORTON

SINCE 1893

GEORGE GORTON MACHINE CO.

2604 Racine Street • Racine, Wisconsin

Tracer-Controlled Pantographs, Duplicators — standard and special . . . Horizontal and Vertical Mills, Swiss-Type Screw Machines, Tool Grinders, Small Tools and Accessories.

A8-1008

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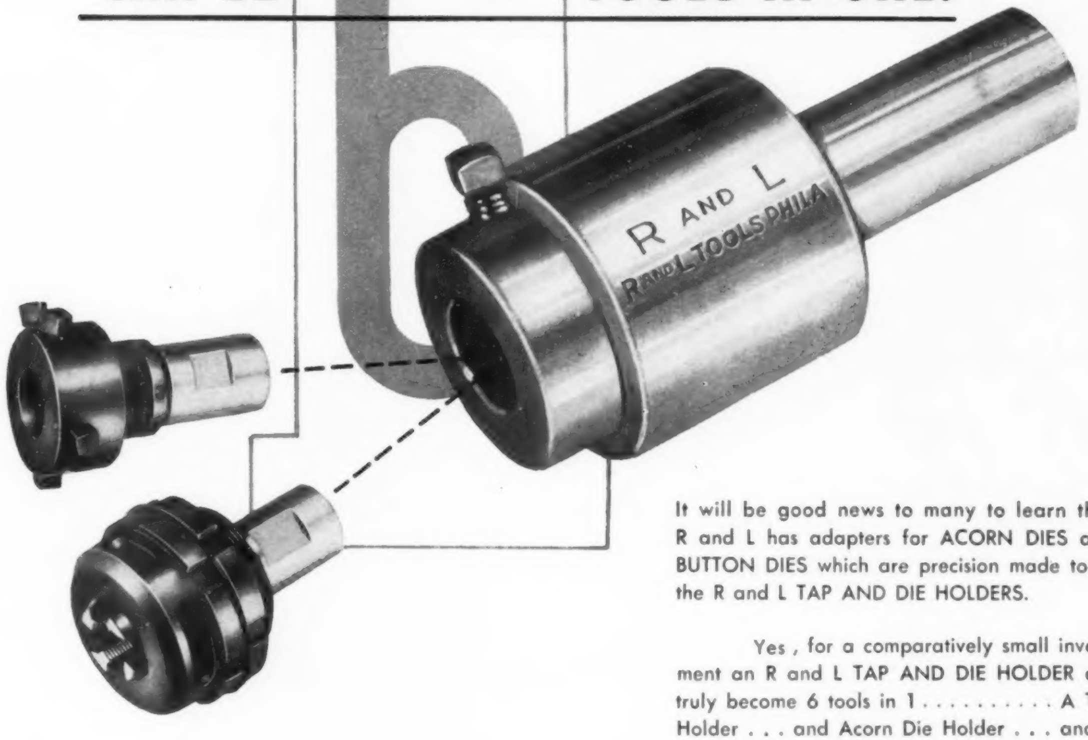
THE RIGHT R and LEFT L TAP AND DIE HOLDER

CAN BE 6 TOOLS IN ONE!



It will be good news to many to learn that R and L has adapters for ACORN DIES and BUTTON DIES which are precision made to fit the R and L TAP AND DIE HOLDERS.

Yes, for a comparatively small investment an R and L TAP AND DIE HOLDER can truly become 6 tools in 1 . . . . A Tap Holder . . . and Acorn Die Holder . . . and a Button Die Holder . . . *For right and left hand threading* and tapping.

LEST YOU FORGET . . .
. . . The R and L TAP AND DIE HOLDER has an entirely new releasing mechanism, and can readily be changed for right or left hand threading and tapping. No spring plungers to wear or break. No small screws to work loose.

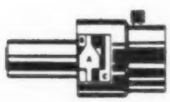


Figure 1.
Ready to start threading operation, clutch slightly engaged at C.

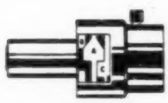


Figure 2.
Instantly engaged to full contact between A and C as soon as tap or die engages work.

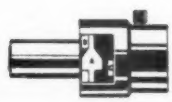


Figure 3
Fully released showing ample clearance between contact points of clutch preventing re-engagement or hammering of clutch points in case turret advances slightly after clutch releases.

• By substituting a shorter clutch ring retaining nut this tool can be readily changed for cutting extra short threads.

Write for NEW catalog

R and L TOOLS TE-4
1825 BRISTOL ST., PHILADELPHIA 40, PA.

☐ Please send me your new catalog
☐ Please arrange for no-obligation demonstration of R and L TOOLS

NAME ....
COMPANY ....
ADDRESS ....
CITY .... ZONE ...... STATE ....

RIGHT R and LEFT L TOOLS

1825 BRISTOL STREET • PHILADELPHIA 40, PA.

OTHER FAMOUS R and L TOOLS:

TURNING TOOL • COMBINATION SWING TOOL • CARBIDE OR ROLLER BACKRESTS RELEASING OR NON-RELEASING TAP AND DIE HOLDERS, (ALSO FURNISHED FOR ACORN DIES) • UNIVERSAL TOOL POST • CUT-OFF BLADE HOLDER • RECESSING TOOL REVOLVING STOCK STOP • FLOATING DRILL HOLDER • KNURLING TOOL

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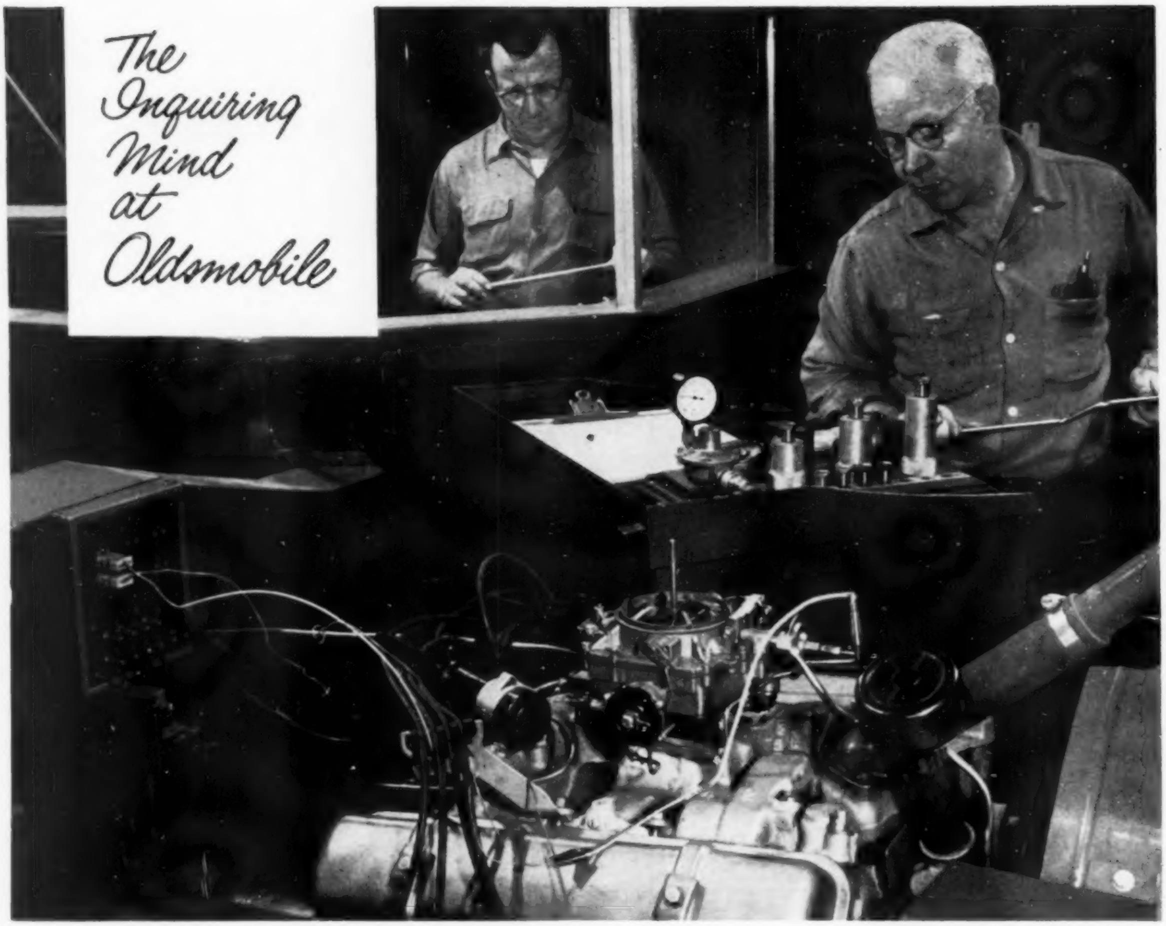


no.2 OF A SERIES

IT "WORKS" WHILE IT WHISTLES

Advanced sonic testing techniques are used to make precision measurements that determine an engine's compression ratio.

To Olds engineers, compression ratio is a direct measure of the engine's thermodynamic efficiency; the higher the compression ratio, the more energy utilized from the fuel. But with higher compression ratios, engineers needed to know whether cylinder heads and combustion chambers were accurate during initial engine development. To meet this challenge, Oldsmobile engineers and General Motors Research developed a simple, yet extremely accurate measuring device commonly called the "whistle checker".

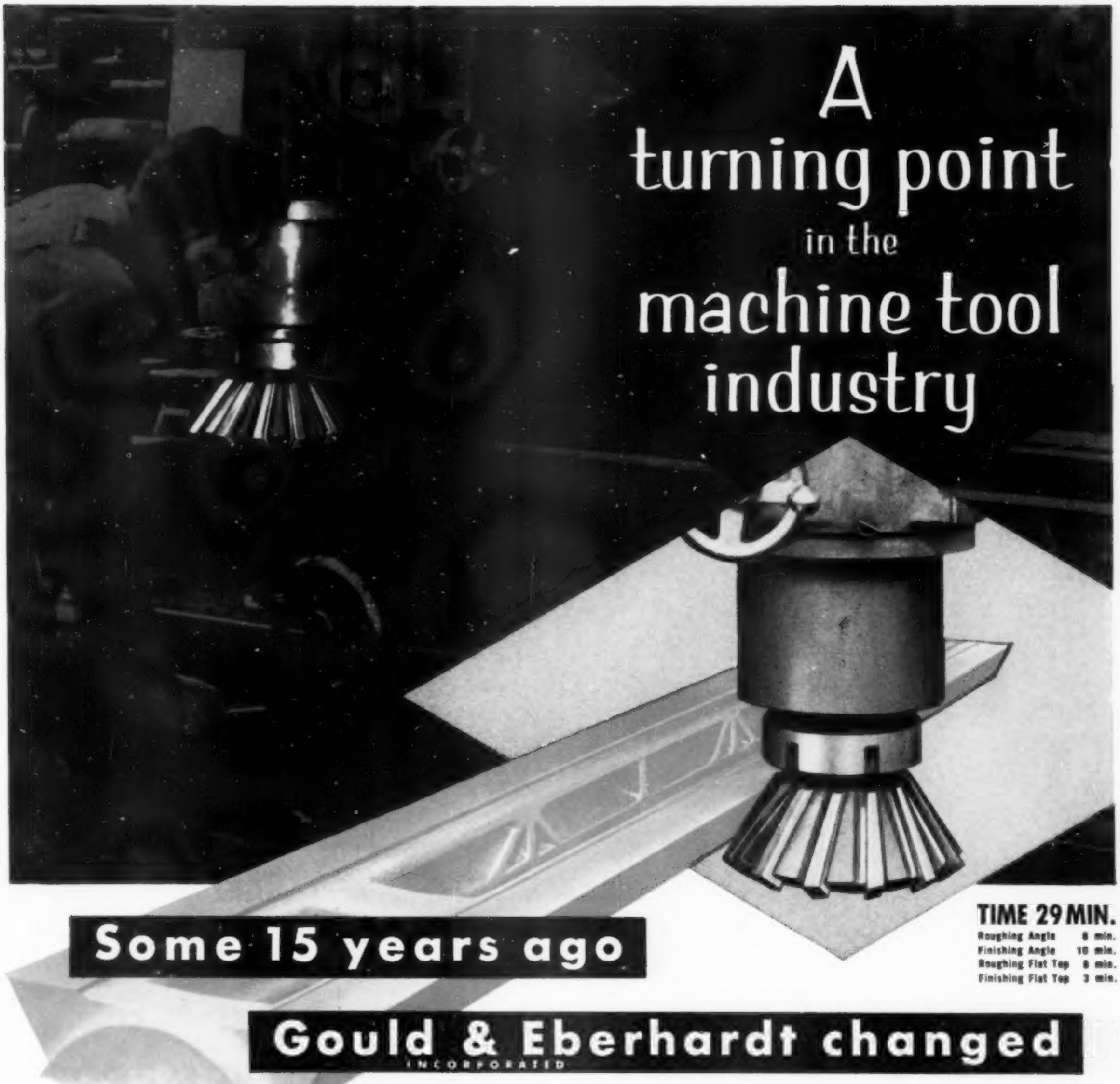
Based on the principle of resonance, the known volume of air in the "whistle checker" is placed in resonance with the unknown volume of air in the combustion chamber. A reading of the micrometer adjusting screw of the "whistle checker" is easily translated into cubic centimeters and is accurate to .2 cc. What is just as important, this instrument can tell if there is any loss of compression due to leakage past the piston rings.

In many ways and in many directions the Inquiring Mind at Oldsmobile is constantly probing, constantly seeking new and better ways to build the finest automobiles in the industry. Try a '58 Oldsmobile on the road. You'll discover the difference for yourself.

OLDSMOBILE DIVISION, GENERAL MOTORS CORP.

OLDSMOBILE

Pioneer in Progressive Engineering ...Famous for Quality Manufacturing



A turning point in the machine tool industry

TIME 29 MIN.

Roughing Angle	8 min.
Finishing Angle	10 min.
Roughing Flat Top	8 min.
Finishing Flat Top	3 min.

Some 15 years ago

Gould & Eberhardt changed
INCORPORATED

multi-diam tools
reamers
boring heads
counterbores
form cutters
trepanning tools
gang mills

. . . changed from planing and hand-scraping to milling and grinding for finishing their 72-inch long meehanite ram used in 36" Industrial Shapers. At that time, not all G & E people were sold on the idea that this particular part was suitable for milling by the proposed new method, but now it is a different story.

Milling, generally speaking, is four times faster than planing; mechanical grinding is ten times faster and more accurate than hand-scraping. Today surface finish is measured by profilometers in millionths of an inch. Along with these advances came quick-acting clamps, quick-change tool adapters, and faster speeds and feeds.

One of the reasons why G & E is sold on milling is the outstanding performance of O K bevel end mills for both the roughing and finishing cuts. They like the simple way blades are set out one serration and ground when dull and the long run between grinds.

For the free audit of any metal-cutting operation, write for our questionnaire. This data is fed into an electronic computer and you will be astonished at some of the results.

THE OK TOOL COMPANY • 300 Elm Street • Milford, New Hampshire

OK

modern milling cutters for modern milling machines

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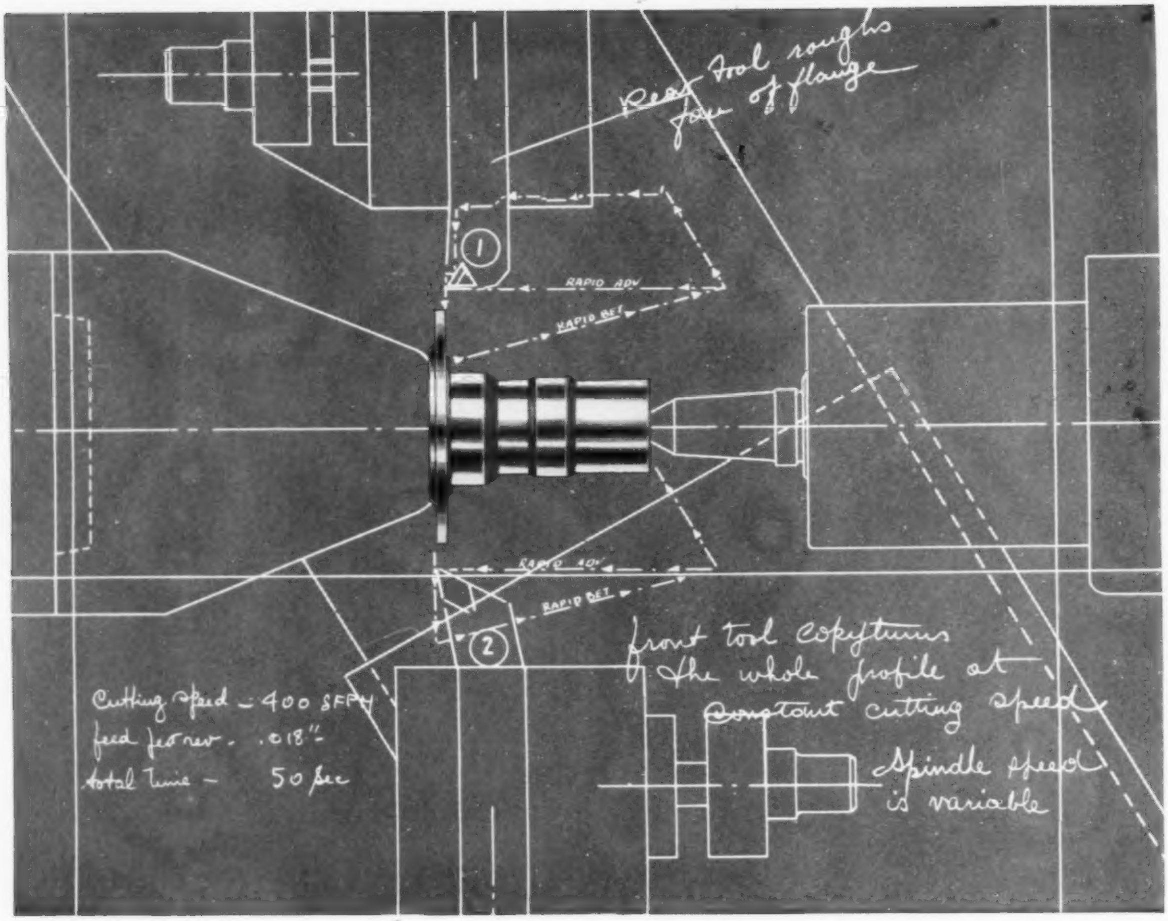
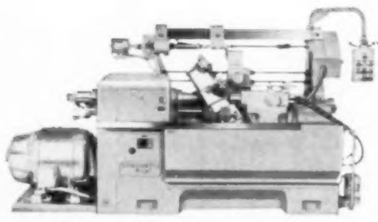


In 50 seconds the Conomatic Pilot copyturns this entire profile at constant cutting speed

The Conomatic Pilot is the only multicycling copying lathe that provides constant feed per revolution by means of a piloted hydraulic feed—an important reason why you can profile turn parts like this to very close tolerances on all surfaces at full production speeds. When used for finishing only, the Conomatic Pilot can often eliminate green grinding operations.

Write today for details of the Conomatic Pilot lathe.



The Conomatic Pilot Model KU is a hydraulically-controlled multicycling copying lathe that can automatically reproduce practically any profile, using a motorized rotating template. It can be adapted to a wide variety of slides and tool stations.

Conomatic

CONE AUTOMATIC MACHINE CO., INC., WINDSOR, VT.

PILOT DIVISION

30 Rockefeller Plaza, New York 20, N. Y.

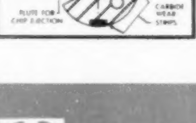
 FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-4-382

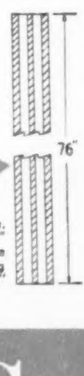
* . . . Drills Deep or Shallow Holes With Extreme Accuracy . . . Alignment . . . and High Surface Finish!

THE CORE . . . Reduces Thrust requirement and minimizes tendency of drill to run.

The detachable design . . . (size 5/16 and larger) allows for easy replacement of carbide heads, an advantage that means less machine down time.

For more detailed information call the STANDARD Man in your area. Take advantage of STANDARD'S Specialized Engineering Service.





PROVEN

Hole 5/16" dia. Length 76" "Accurate one drilling operation"

TARGET GUN DRILL ADVANTAGES:

- Eliminates zero surface speed at center.
- Rigid, sturdy shank . . . Starts straight. Stays straight.
- Accurate diameters and alignment. Can often eliminate reaming operations.

The STANDARD Distributor in your area stocks a complete line of rotary metal cutting tools.

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Cuts die-grinding time 20%

WITH ROTOR'S 40,000 RPM BLADED TYPE TOOL

JOB: Die grinding. Formerly used bulky turbine type air grinders. Power dropped under load. Switched to Rotor D-03 Pencil Air Grinder.

RESULTS: Bladed type motor of Rotor D-03 cut job time 20% because of its ability to deliver higher speed under load. Tool paid for itself in 8 weeks. Also, tool is lighter, more compact . . . easier to handle, more versatile. Full details in Bulletin 42A.

Have a Rotor Application Engineer study all of your portable tool operations for possible savings. No obligation.

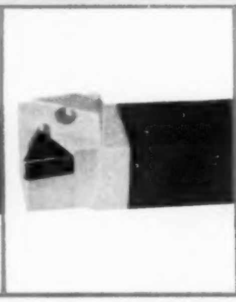
ROTOR TOOLS®
CLEVELAND, OHIO

Rotor Air Tools: Assembly Tools • Drills • Small Wheel Grinders • Straight Grinders • Vertical Grinders • Scalers • Chippers • Rammers
Rotor High-Cycle Electric Tools: Grinders • Polishers • Sanders

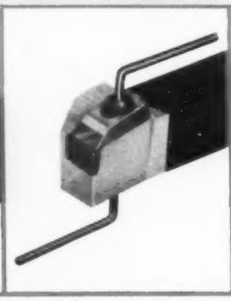
ADAMAS DEX-A-TOOL cuts machining costs

Only Dex-A-Tool gives you all 10 modern design features . . . features that mean faster set-up, closer tolerances, fewer parts, and less downtime.

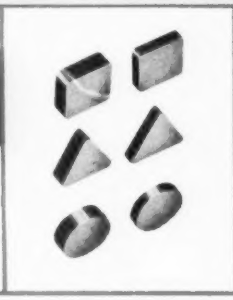
1 **Fully adjustable chipbreaker** . . . in increments of .030". Insures excellent chip control. One piece positive locking. No wasted machine time changing non-adjustable chipbreakers to get proper chip control.



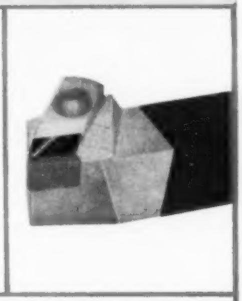
2 **Extra thick carbide anvils . . .** thickest shank-supported anvils in the industry. The thick anvil in Dex-A-Tool gives more rigidity to throwaways and provides the ideal platform for maximum insert performance.



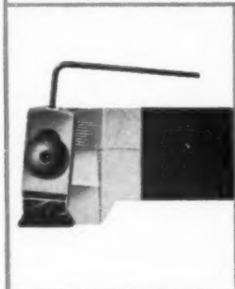
3 **Easy indexing** . . . clamp locking screw may be loosened from bottom as well as top. Simplifies insert indexing when holder is upside down.



4 **Holds both "thick" and "thin" inserts** . . . allows you to utilize economical thin inserts (⅛") wherever possible and still maintain the advantage of switching to thick inserts (3/16") whenever necessary.



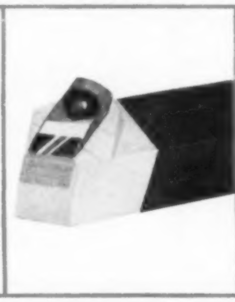
5 **Chipbreaker Clamp Faced with Thick Carbide** . . . provides much more wear resistance than thin carbide coating or cast alloy clamp.



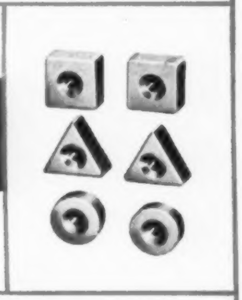
6 **Setscrew chipbreaker clamp** . . . permits fast positive resetting of chipbreaker after insert indexing. Nylon plug engages the setscrew and prevents any loosening of setscrew.

7 **Combination chipbreaker—clamp** . . . single unit construction means no loose chipbreakers to fall out. Inventories reduced. Simpler use gives a savings in production time.

8 **Anvil invertible as well as indexable** . . . extra thickness of anvil allows countersinking of both sides. This permits anvil to be inverted for extra life.



9 **Special high temperature brazing alloy** . . . used in brazing carbide chipbreaker to clamp. Prevents braze failure during high machining temperatures.



10 **Carbide or steel anvils** . . . your choice of carbide or copper plated hardened high speed steel anvils.

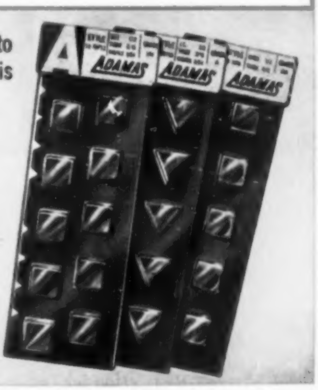
No other toolholder has fewer parts than Adamas Dex-A-Tool . . . none are easier to operate. Dex-A-Tool's features add up to more production per insert corner. Measure this extra savings on your own machines . . . plan a test of Adamas Dex-A-Tool today!

For additional Dex-A-Tool literature, an actual demonstration test, or a free copy of "Throwaway Tooling Set-up and Follow Thru" write: Dept. 263

ADAMAS
CARBIDE CORPORATION, KENILWORTH, N. J.

PRODUCERS OF TUNGSTEN CARBIDE TOOLS, TOOL TIPS, DIES, WEAR PARTS, DEX-A-TOOL AND CERALOX.

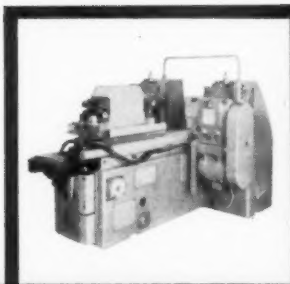
Team Dex-A-Tool with Adamas throwaway inserts and gain top performance under varying machining conditions . . . top performance possible only through Adamas wide range of quality controlled grades.

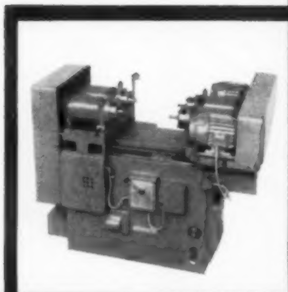


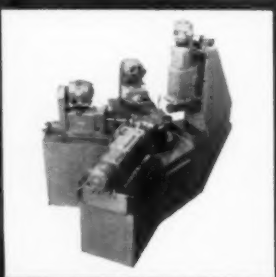
National distribution of Olivetti sensitive drill presses, cylindrical grinders, production milling machines, automatic boring machines, and units for automation is being established throughout the U.S. Olivetti has been making quality machine tools for over 30 years. For sales, service or information, call or write Olivetti Corporation of America, Machine Tool Division, 42-33 Northern Boulevard, Long Island City, N.Y.

olivetti

See Olivetti machine tools at the ASTE Tool Show.







SOME FEATURES OF OLIVETTI DRILL PRESSES

Hydraulic head or table raising/ precision spindle/ flat belt drive for minimum vibration/ solidly built (T6-b weighs 176 lbs.)/ extra-sensitive adjustable spring return feed lever/ work light (extra) built into head/ powerful (T6 has a 3/4 H.P. motor).

Model T6-b (shown above) has 7/32" capacity, 8 speeds up to 12,000 r.p.m. Other models: T12, 15/32" capacity; T18, 11/16" capacity.

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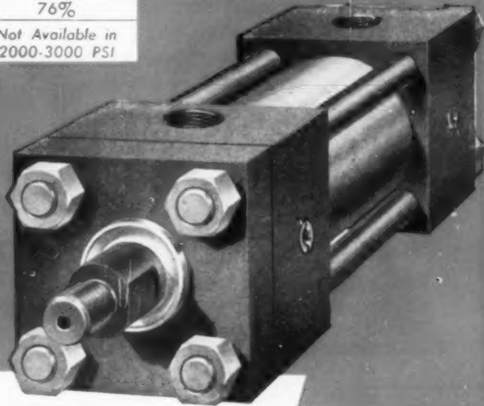
NEW Miller "JOB RATED" HYDRAULIC CYLINDER LINE

JOB RATED, MODEL " J "			
BORE	SEVERE OPERATING CONDITIONS	MODERATE OPERATING CONDITIONS	YOU SAVE THIS % IN PRICE OVER STANDARD 2000-3000 PSI CYLINDERS
1½"	1500 PSI	2500 PSI	27%
2	1500	2500	27%
2½	1000	1500	28%
3¼	1500	2500	32%
4	1000	1500	35%
5	800	1200	37%
6	800	1200	43%
8	500	800	50%
10	500	800	71%
12	500	800	76%
14	500	800	*Not Available in 2000-3000 PSI*

with IDENTICAL seals, design, and safety factors as the famous Miller "Power-Packed" Model "H" Line for 3000-5000 psi service.



SEAL FAILURE MEANS CYLINDER FAILURE!

1. *No seal made of synthetic rubber is compatible with even 50% of available, commercial, petroleum base hydraulic fluids.*

MILLER Uses All Teflon* Seals to Eliminate External Oil Leakage because Teflon is impervious to all known hydraulic fluids, even fire-resistant types.

TEFLON SHEF SEAL At Tubing Ends

No blind assembly. Is
Shear-proof
Heat-proof
Extrusion-proof
Fluid-proof

TEFLON Seals On Piston Rod And Bushing

Teflon rod flange seal requires no adjustment. Teflon bushing seal is shearproof. Teflon wiper keeps dirt out.

TEFLON Seals On Ball Check And Adjusting Screw

Non-protruding, self-locking, cushion adjusting screw interchangeable with ball check for easy access.

MILLER Uses Resin-Impregnated Leather Piston Cup Seals because they are compatible with petroleum base fluids and some fire-resistant types. Teflon cups available at small extra cost.

2. *Nicked or scored piston rods cause seal failure*

MILLER Uses Case-Hardened Chrome-Plated Piston Rods because they prevent nicks, scoring and rust.

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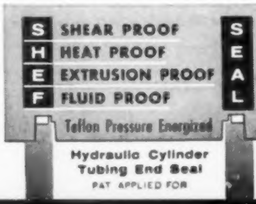
NOW! . . . You can save MORE with quality Miller "Job-Rated" Cylinders than with cut-price, lesser quality hydraulic cylinders. And the "Job-Rated" Cylinders are also available under the same immediate shipment program as the Power-Packed Line (2 hours if necessary—3 days normal).

*du Pont trademark for tetrafluoroethylene resin which withstands temperatures from −100° F. to +500° F. and all hydraulic fluids.



OTHER MILLER QUALITY FEATURES

- Rust-Resistant Surfaces
- Interchangeable, Space-Saving Square, 4-Tie-Rod Design
- Precision Honed Barrels

MILLER FLUID POWER
DIVISION OF FLICK-REEDY CORPORATION
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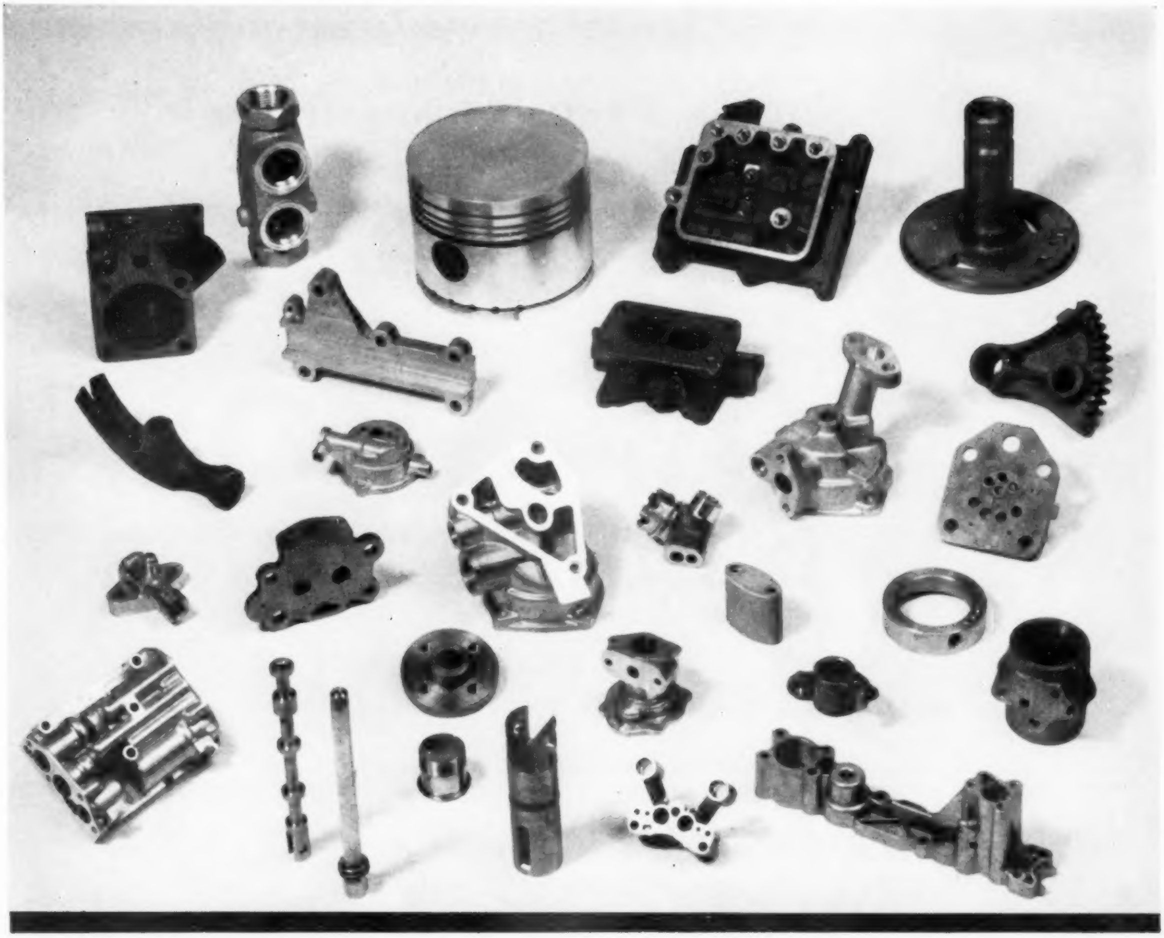
AIR AND HYDRAULIC CYLINDERS • ACCUMULATORS
COUNTERBALANCE CYLINDERS • BOOSTERS



Parts made by almost every industry have holes made by a KINGSBURY

From the carburetor body to the lock cylinder . . . the bearing race to the hammer head . . . would just be a variety of parts — except for one important advantage in common:

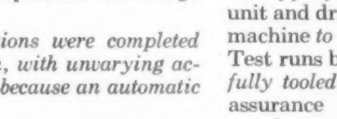
> *the drilling and tapping operations were completed faster, at lower cost per operation, with unvarying accuracy — in every single part — because an automatic Kingsbury machine did them.*

This can mean a distinct manufacturing advantage to *you*, if you have high production drilling, tapping, reaming, spot facing, light milling and similar operations to do on your parts. You can do them at the *rates you need*, at the *lowest practical cost, month in and month out*, on a Kingsbury indexing automatic.

"Kingsbury jobs" — as the automotive and appliance industries frequently call them — are typically done in this manner: The manufacturer sends Kingsbury a print (or sample) of his part, specifying operations and the production rate required. Kingsbury then incorporates the appropriate standard operating units, base, indexing unit and drive, to build an automatic drilling and tapping machine *to do what the customer wants, at the rate he wants.* Test runs by Kingsbury *before* shipment, and *delivery of a fully tooled machine* ready to produce, provide positive assurance that performance will match production requirements.

Whether you make automotive, plumbing, hardware, machine, electrical appliance or some other kind of parts, investigate the production and cost benefits in doing the drilling and tapping on a Kingsbury. Send your requirements and questions to Kingsbury Machine Tool Corporation, Keene, N. H.

KINGSBURY



INDEXING AUTOMATICS
for high production drilling and tapping

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TOOLING FOR COMPETITION

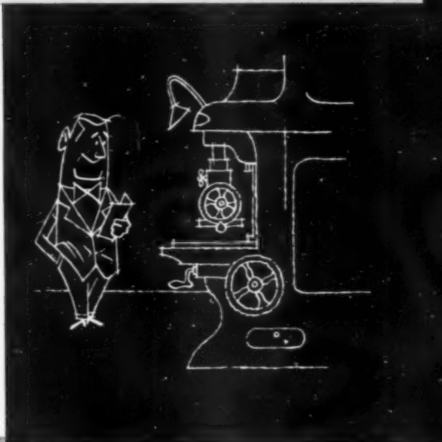
ATTEND THE

1958 ASTE TOOL SHOW AND CONFERENCE

CONVENTION CENTER
PHILADELPHIA, MAY 1-8

SEE all the very latest advancements and improvements in more than thirty major categories of industrial products.

It's the year's most notable industrial event . . . it's your chance to see tooling's future, *your* future on display, at *one* time under *one* roof . . . it's the 1958 *TOOL SHOW!* See for yourself all the newest developments in manufacturing equipment, all the latest ideas in production methods. See thousands of products, hundreds of product demonstrations, presented by 487 exhibitors. Don't miss it. Plan *now* to attend.



ATTEND top level conferences, conducted by recognized authorities on the newest production techniques and developments.

Symposia, panels and technical papers (more than 80 of them) will be devoted to timely subjects of vital interest to today's industry . . . subjects like the following . . . Automation* • Materials of the Future • Numerical Control • Guided Missiles • Plastic Tooling • Nuclear Engineering • Shaped Diamond Tools* • Planning for Profit • Ceramics • Powdered Metal Parts Tooling • European Tool Engineering • Gauging Techniques • Safety Engineering • Metal Cutting* • Shell Molding.

**Symposium*

MEET **and exchange ideas with management, engineering, production, sales people from the nation's leading industrial concerns.**

Industry's "D-men" . . . designers, deciders, doers . . . will be out in strength for the 1958 *TOOL SHOW*. ASTE's Registration Listings, in fact, read like blue ribbon rosters of industrial America. And small wonder! . . . for the ASTE *TOOL SHOW* is industry's greatest open forum for exchanging ideas, solving problems, *"tooling for competition"*. What better opportunity for keeping yourself informed and up-to-date? . . . and what could be more important in these competitive times?

INSPECT **the modern equipment and up-to-the-minute manufacturing methods being utilized in booming Delaware Valley plants.**

Yes, you'll have an opportunity to see industry in action, too, because arrangements have been made for 28 tours through Philadelphia area plants . . . including the U.S. Navy Yard.

These 14 plants will be open for your inspection . . . Standard Pressed Steel • U.S. Steel • Leeds & Northrup • Chrysler-Plymouth • Cuneo Eastern Press, Inc. • Campbell Soup Co. • I.T.E. Circuit Breaker • Schramm, Inc. • Yale & Towne • Budd Company • Brown Instrument • Link-Belt • Fischer & Porter • Curtis Publishing.

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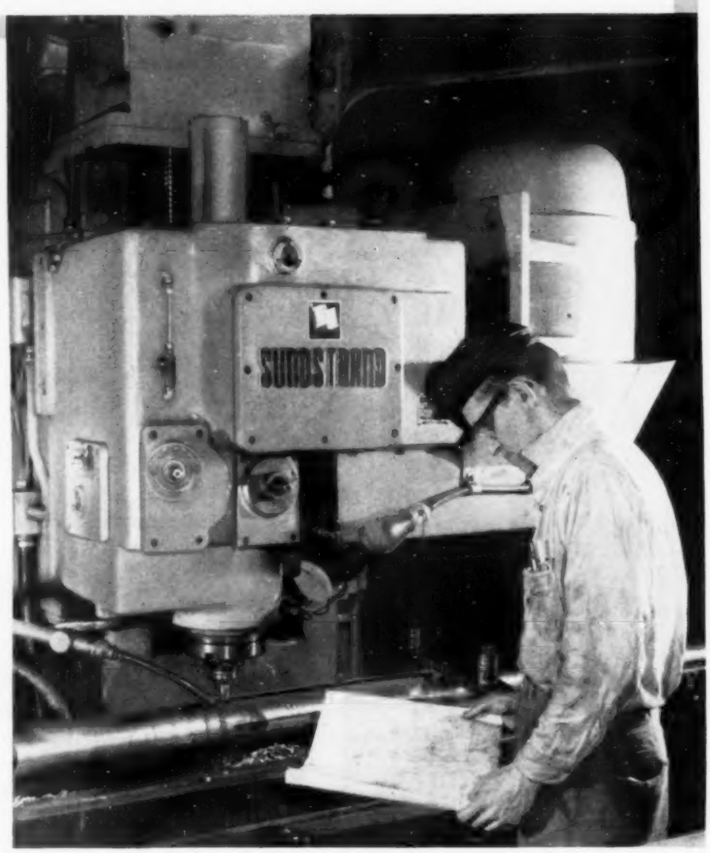
CONFERENCE
'58
MAY 1 TO 8
OF TOOL ENGINEERS

Rigidmil Boosts Keyway Output 40% at Jones & Laughlin



Milling keyways on tough steel shafts for rolling mills at Jones & Laughlin Steel Corp.'s Pittsburgh Works requires a machine with the unmatched sturdiness and accuracy of the Sundstrand Rigidmil. Since the machine went into production a little over a year ago, these benefits have been realized:

1. Production is up 40 per cent. Hourly output varies depending on the shaft size.

2. Accuracy is way up, tolerance within .001-inch is maintained readily. Surface finish realized is just below grinding standards.

3. Maintenance time is way down, is no longer a factor in total operating costs.

4. Rigidmil handles work up to 12 inches in diameter, compared with 9 inches formerly.

5. Finish cutters can be used for the complete job on keyways up to 2 inches, eliminating need for tool change.

This capacity for turning out work to exceptionally high quality standards over a broad range of parts is characteristic of Sundstrand Rigidmils. Finger-tip control and maximum operator convenience cut the time between setups and keep the machine in production a higher percentage of the time than is possible with conventional machines. Features such as these, plus the application of Sundstrand "Engineered Production" to your specific needs, are your assurance of top efficiency whether you are interested in job lots or high volume.

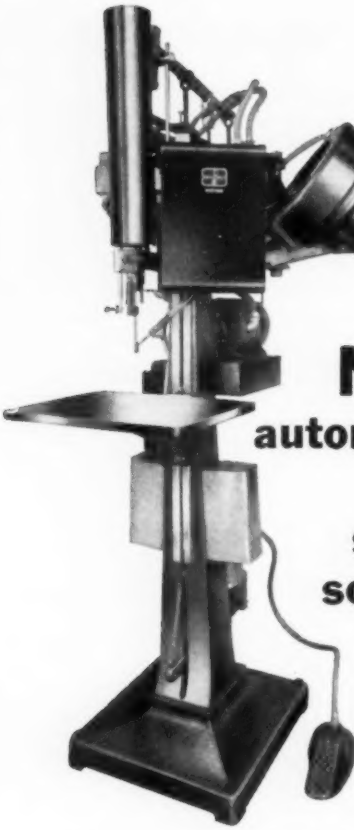
Write for Bulletin 790 describing Sundstrand's new C Model Rigidmils.

SUNDSTRAND MACHINE TOOL CO.

2540 ELEVENTH ST., ROCKFORD, ILLINOIS

SUNDSTRAND "Engineered Production Service" REG. U.S. PAT. OFF.

AUTOMATIC LATHES | SIMPLEX RIGIDMILS | DUPLEX RIGIDMILS | TRIPLEX RIGIDMILS | SPECIAL MACHINES



Now... automatically apply standard socket set screws

SPEED SMALL PARTS ASSEMBLY

Here's the fastest way to insert and drive *standard* Bristol socket set screws . . . screws are inserted and driven at an average rate of 1800† per hour!

Just load hopper with socket set screws. Automatically they're positioned correctly and fed to the bit of the power screwdriver. Then they're inserted in tapped hole and tightened to predetermined torque or depth setting.

Fast Production. . . of set-screw fastened parts like pulleys, impellers, fan blades, knobs, collars, gear sprockets, bearings, cams, dogs, couplings and cranks.

No special screws required. Takes standard Bristol Hex or Multiple-Spline socket; cup, flat, oval, cone or half-dog point.

Uniform torque settings. Drives all screws to same (easily adjusted) pre-set depth or torque.

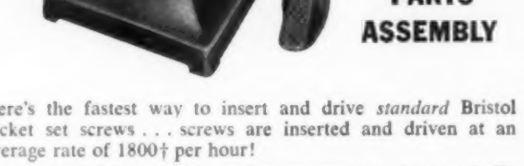
Reduces operator fatigue. Stops floor loss of screws. Eliminates cross-threading. Quick change-over for different sizes. Reduces floor area needed for assembly.

Get complete data on this outstanding mass production tool today. Write to the Application Engineering Department, Socket Screw Division, at the address below.

†Assembly speed varies with factors such as time required to present parts, screw thread pitch, length of screw, and depth of insertion.

A. B. 4

Precision socket screw manufacturers since 1913



*Made in sizes as small as No. 0 in Alloy Steel and Stainless Steel. Cap screws up to 1½" diam.

THE BRISTOL COMPANY Socket Screw Division Waterbury 20, Conn.

See our exhibit in Booth 1447 at the ASTE Show
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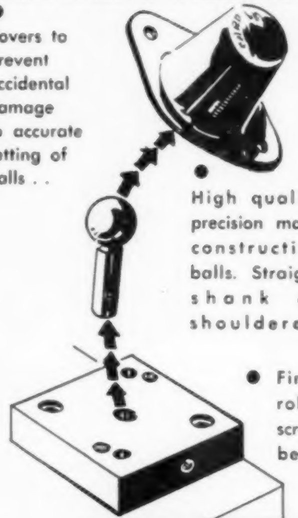
Need Construction Balls, Pads and Covers?

Carr-Lane's Line is COMPLETE



• Covers to prevent accidental damage to accurate setting of balls . .

• High quality precision made construction balls. Straight shank or shouldered.

Regardless of your requirements CARR-LANE'S complete coverage will give you better jig components at a better price and will meet your schedule on delivery.

• Finished pads of cold rolled steel drilled for screws and dowels. Can be stamped with ball setting. For all sizes of ball shanks.

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- Fit any power press
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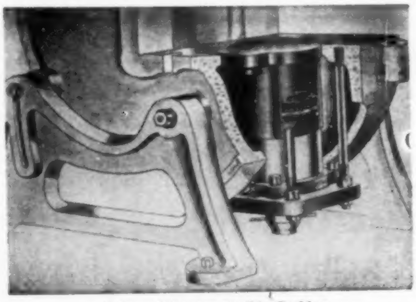
- Engineering service available



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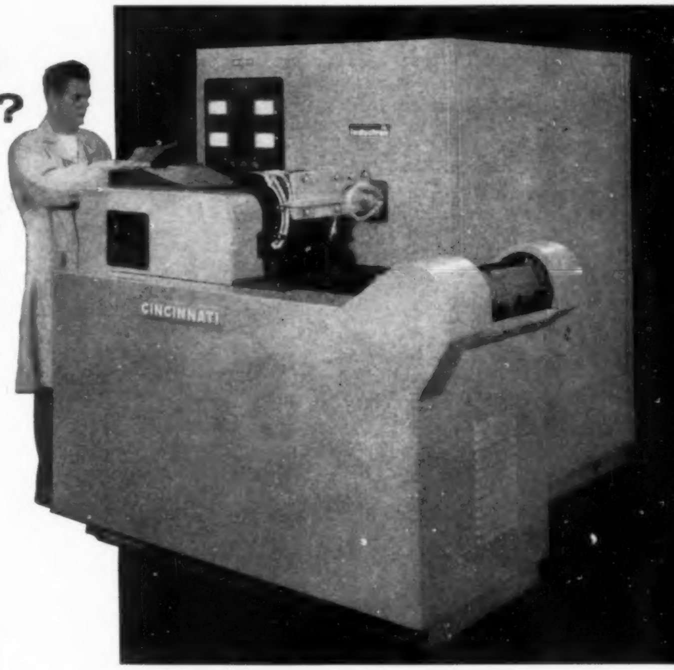
In production, the machine shown uses multiple fixtures for selective surface hardening *1000 automotive rocker arms per hour.*

which CINCINNATI meets your selective surface hardening needs?

Your product components that require heat processing—such as selective surface hardening, annealing, brazing, tempering—can be Cincinnati-processed at a savings! New and versatile Cincinnati flame or induction heating machines can do the work you specify—and meet your cost-per-piece requirements-on high production quantities or varied, small-lot runs. Let a Process Machinery Division field engineer evaluate your needs. With the assistance of our extensive research laboratories and engineering facilities, he is ideally equipped to recommend the heat source and method that will be best and cheapest for you.



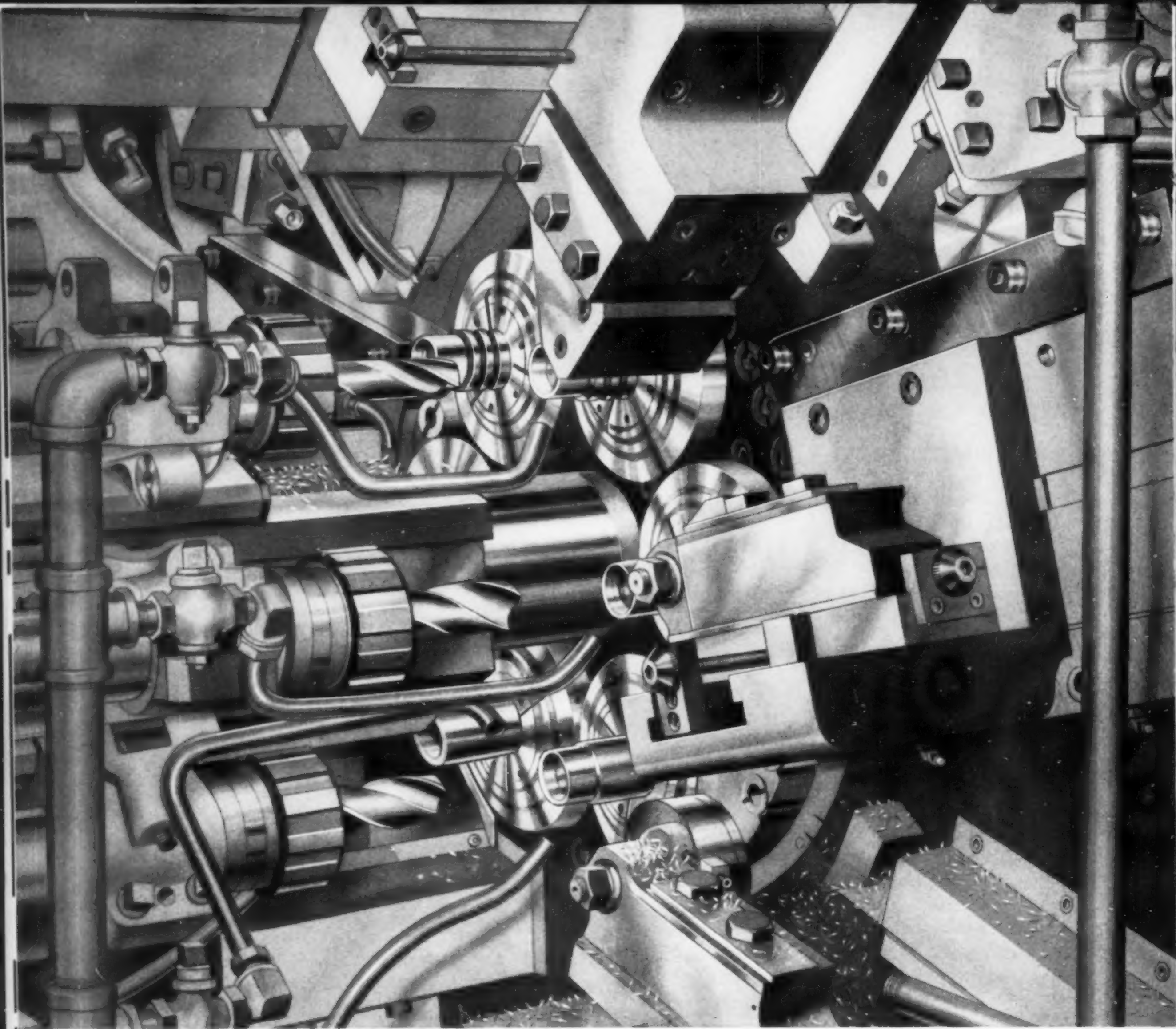
See these two machines in operation, ASTE Show, Booth No. 1555, Philadelphia Convention Center, May 1 through 8.

New CINCINNATI
inductron®

This machine induction hardens both ends of *automotive push rods at the rate of 3600 parts per hour.*

CINCINNATI
flamatic and inductron
hardening machines

Meta-Dynamics Division
THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO, U. S. A.



NEW BRITAIN AUTOMATIC BAR MACHINE

Erickson Precision Expanding Mandrels Solve Machining Problems

One of a Series

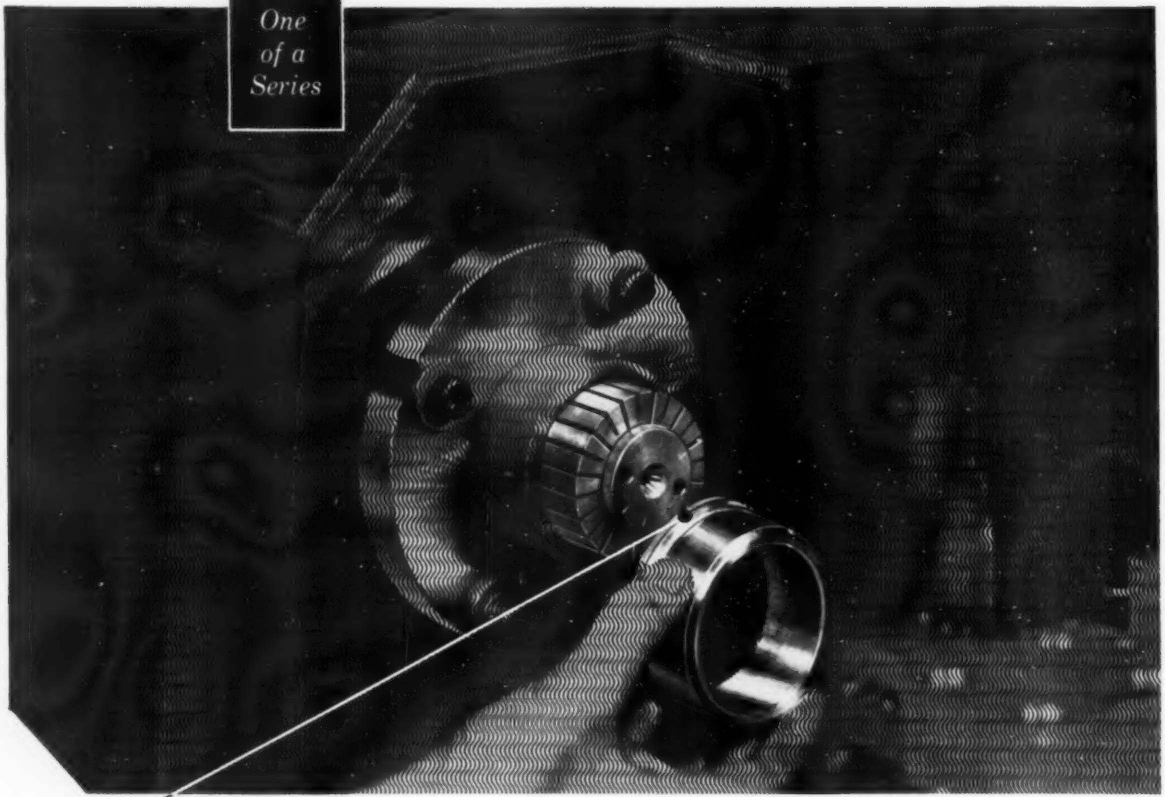


Photo: Courtesy Ex-Cell-O Corporation, Detroit, Mich.

e. g. stainless steel aircraft sleeves

Tolerances of the highest order are required on aircraft sleeves. And when the material is stainless steel this can lead to production problems.

But Ex-Cell-O Corporation short-circuits their problems by using an Erickson 4½″ C Drawbar Expanding Mandrel on an Ex-Cell-O precision boring machine. By using the Erickson mandrel they are able to machine completely the outside diameters, face a shoulder and put chamfers on both the OD and the ID of the exposed end. Production is up, rejects and scrap are down.

If you have a production part requiring exceptional tolerances . . . if instantaneous release feature can speed loading or unloading—Erickson Precision Expanding Mandrels can pay real production dividends.

AA-6723

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Floating Holders
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Booth 805

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Guaranteed Accuracy

ERICKSON TOOL COMPANY

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Tap Holders
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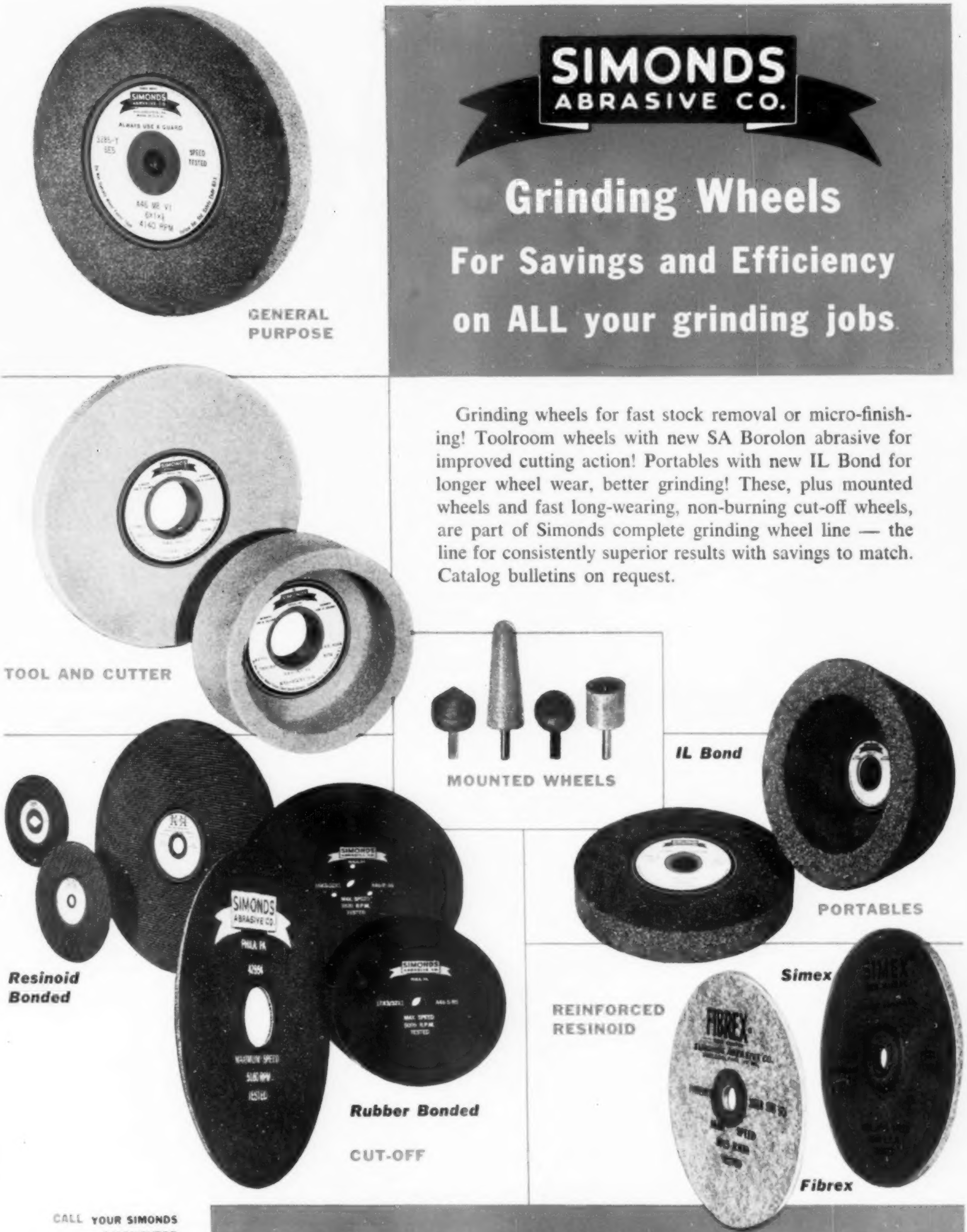
Expanding Mandrels
Special Holding Fixtures

Plagued by tough holding problems? Then let us show you how Erickson Precision Expanding Mandrels speed production and slash costs of machining, grinding, assembling or inspection. Write for your free copy of Catalog K today.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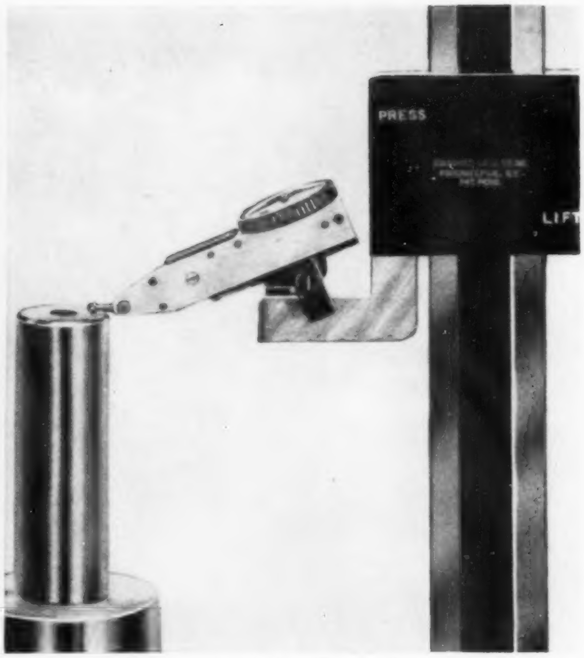

(Left) CHECK MASTER contact point on work piece shown 22 times actual size. To see the smallest variations CHECK MASTER will detect, illustration would need to be 500 times actual size. (Right) CHECK MASTER on STANDARD Comparator Height Gage gives "tenth" accuracy.

The Importance of Measuring Practically Nothing

In gaging, the smaller the variation, the harder it is to measure. Yet, accurate checking of microscopic variations is what makes the difference between ordinary and truly fine precision manufacture.

CHECK MASTER

Is so unusually sensitive that it responds to dimensional variations as fine as .000020"!

Use this versatile precision instrument in setting up work ON a surface and truing pieces IN machine tools. You'll find it superior in actual feature-by-feature comparison to any similar device in the industry (See chart opposite).

Ask the *Man from Standard* or Write for CHECK MASTER Bulletin

COMPARATIVE ANALYSIS OF TEST INDICATORS

	STANDARD CHECK MASTER	Make A	Make B	Make C	Make D	Make E
Bearings Jeweled	ALL	Some	None	None	None	Some
Bearings Removable	ALL	Some	Some	None	ALL	ALL
Pivot Ends Covered	YES	YES	No	No	No	YES
Ratchet Contact Point	YES	YES	YES	No	YES	No
Contact Pressure (gr.)	21-21	23-33	23-33	23-23	45-49	28-38
Contact Pressure Equal in Both Directions	YES	No	No	YES	No	No
On-Center Mounting Vertical & Horizontal	YES	No	Vert. Only	No	Vert. Only	No
Absence of Reversing Lever	YES	No	No	YES	No	No
Total Weight (grams)	29	42	33	70	77	35
Hand Rotation Always Clockwise	YES	No	No	YES	No	No
.001" & .0001" Convertible	YES	No	No	No	No	No

STANDARD® SINCE 1925 GAGE COMPANY, INC.
POUGHKEEPSIE, N.Y.

A COMPLETE LINE OF GAGES . . . INDICATING, FIXED AND ADJUSTABLE TYPES

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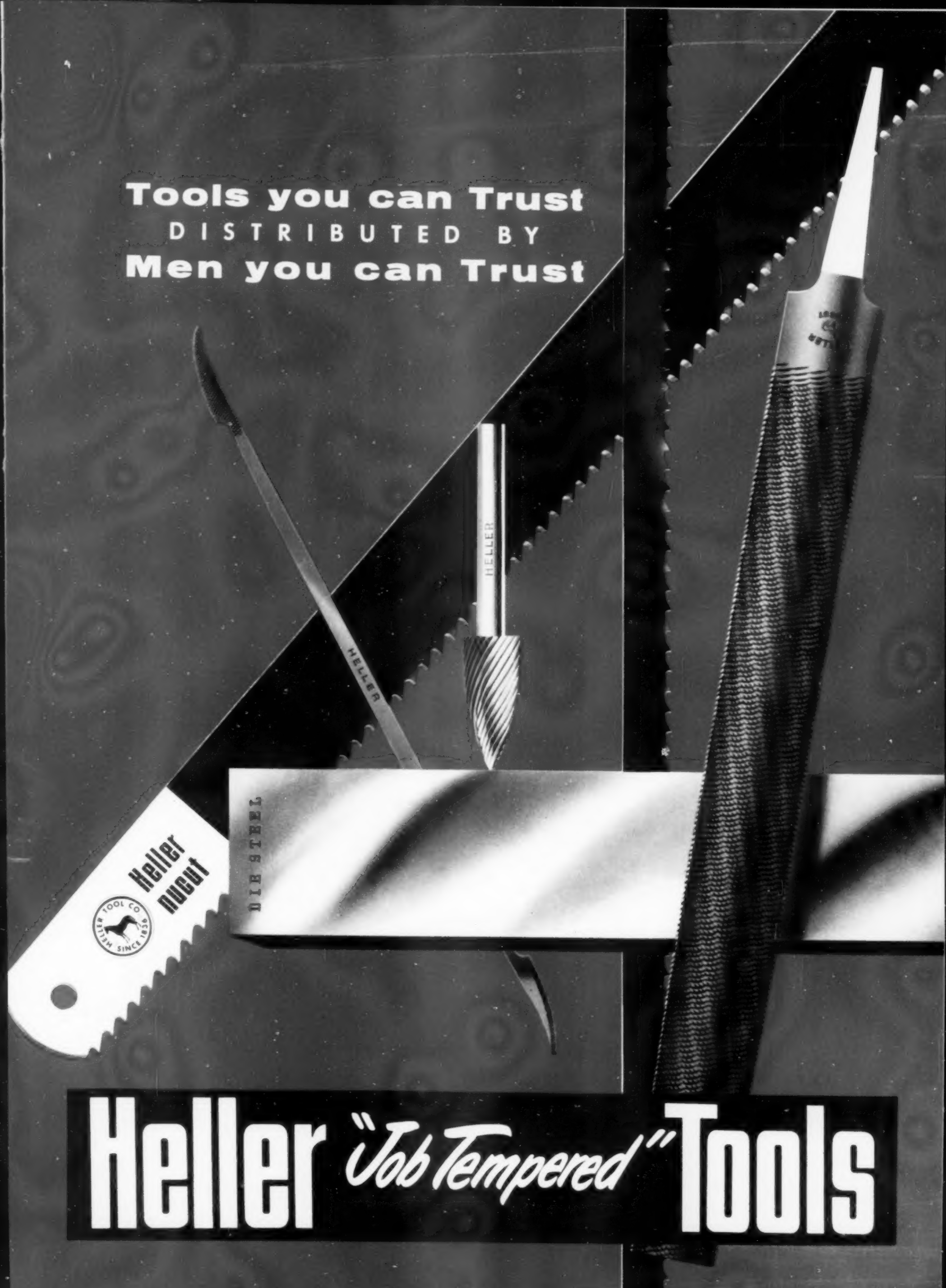
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Men you can Trust
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Heller "Job Tempered" Tools

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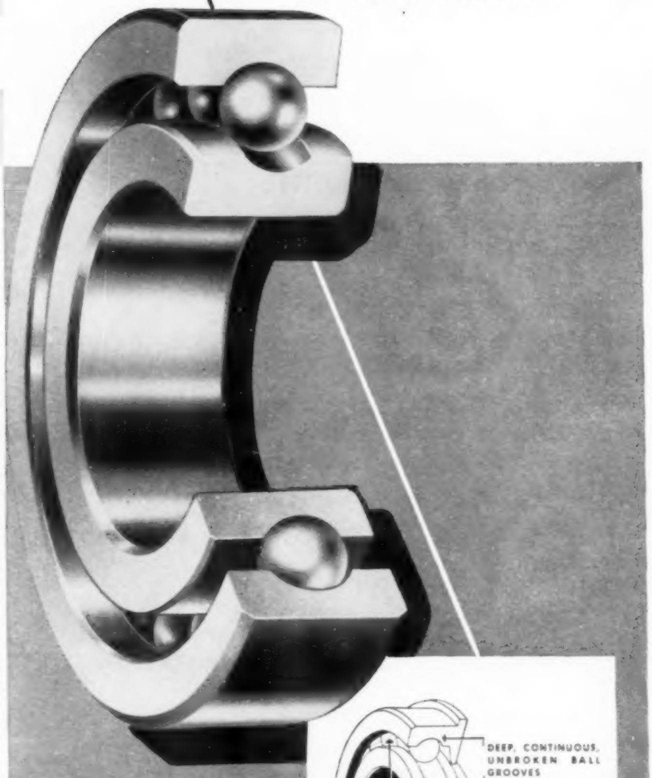
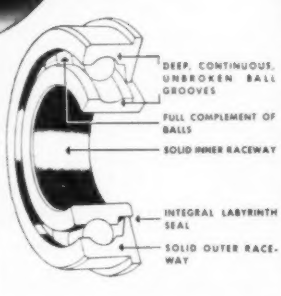
Premium Performance at Lower Cost

with **BALL BEARINGS** *of Revolutionary New Construction!*





NICE now offers the revolutionary new UNIBAL® . . . a low cost ball bearing of superior quality and greater durability, suitable for requirements ranging from the commercial field to many precision applications heretofore using conventional ground bearings. Its simplified construction and assembly method incorporates a new concept in design.* There are no loading slots . . . no split raceways, yet there is a full complement of balls.

Deep, unbroken ball grooves, with closer tolerances and improved finish, provide quiet, smoother operation, with maximum capacity for radial and thrust loads.

UNIBAL Ball Bearings can be furnished in single row, double row, flanged or snap ring types in a wide range of widths and diameters, and the novel construction permits a variety of shield and seal devices.

Your Inquiries Invited.

*Patent Applied For.

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NICE BALL BEARING COMPANY
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The New

ELECTRO-AUTOSIZER

an attachment which

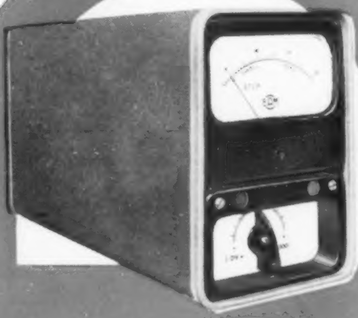
AUTOMATES ANY OF YOUR PRESENT MACHINE TOOLS . . . by transmitting workpiece data *in process*

- **GRINDERS** all types including surface and centerless
- **HONING MACHINES**
- **LATHES**
- **JIG BORERS**
- **MILLERS**

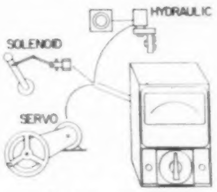
Will feed back I. D. data from a finished piece to machine controls so that the mating workpiece being ground fits exactly...in one chucking.

Use it also for automating post process inspection.

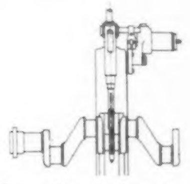
For large or small lot jobs, with loose or extra fine tolerances, the ELECTRO-AUTOSIZER attachment is your ECONOMICAL key to automation.



Tracing—In Process



Quick Installation



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your key to automation...

The remarkable new Electro-Autosizer is a complete electronic control unit for monitoring and computing sizes or shapes...quickly, simply, economically, unerringly.

New electronic transducing principle eliminates "drift" and other ambient influences.

Ruggedly constructed to provide long maintenance-free operation.

EAM were the first to generalize the use of workshop precision control gauges.

Dial your size!!

Just one operator does the work of a whole department—effortlessly.

Send us your processing problems...there's a factory expert in your area available for consultation.

EAM **ELECTRO-AUTOSIZING** *Machine Corporation*

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How to reduce your mold costs

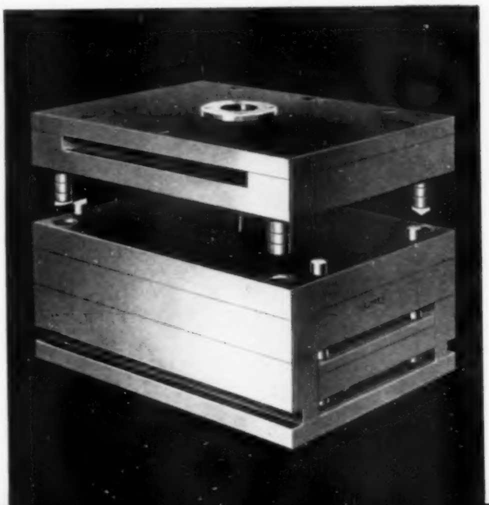
D-M-E STANDARD MOLD BASES can reduce your mold costs in the design stage . . . during construction . . . and throughout the operation of the mold.

Mold designers can reduce drawing board time by using D-M-E's full-scale Master Layouts, which provide locations of leader pins, return pins, screws and other standard details. Complete catalog specifications and prices on 31 standard sizes—up to $23\frac{3}{4}$" x $35\frac{1}{2}$"—eliminate guess-work in estimating the cost of the mold.

But your savings don't end there: Moldmaking time is turned into dollars earned, because all the plates in the assembly are precision ground—flat and square—ready for the moldmakers' layout and machining (pictured below). The exclusive inter-changeability of all D-M-E plates and component parts give you the added saving of immediate replacement in case of emergency.

For the molder, the use of higher grades of CLEANER steel in D-M-E Mold Bases means added strength and longer mold life. And D-M-E's range of standard sizes fit into *more* molding machines.

Start saving now . . . with D-M-E STANDARD MOLD BASES!



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Beaver CALIBORE

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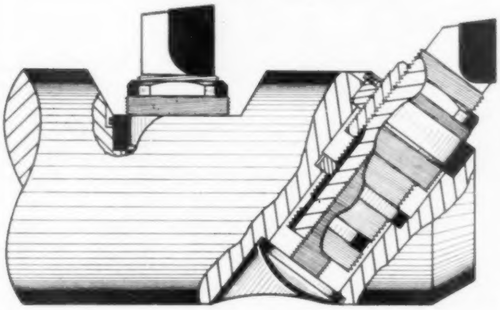

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- Self lock adjustable tool units
- Offset boring head
- Installation tools, parts and prints for customer self installation
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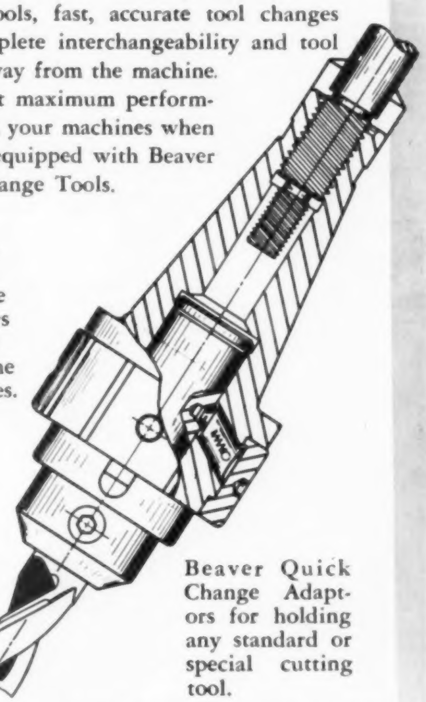
- Complete engineering service

Beaver QUICK CHANGE TOOLS

The Beaver Quick Change tooling system offers these important features . . . Standardization of all machine spindles and all cutting tools, fast, accurate tool changes with complete interchangeability and tool setting away from the machine. —You get maximum performance from your machines when they are equipped with Beaver Quick Change Tools.



Beaver Quick Change Holders for all machine spindles.

Beaver Quick Change Adaptors for holding any standard or special cutting tool.

SEE US AT THE **ASTE** TOOL SHOW
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Lindberg Cyclone batch type furnace for heat treating aluminum castings.

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Delicacy or fragileness no longer need be associated with accuracy!

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An accidental blow, due to handling, or mistake in setup, merely deflects the Gage Tip instead of transmitting the blow and damaging the gaging elements.

Only available on *new* Cleveland INDI-AC Electronic Height Gages — or as a replacement for standard tips on INDI-AC'S now in service.

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- 4″ to 24″ Stroke
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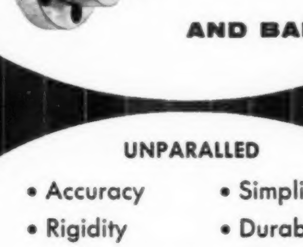
DEKA BORE

BORING HEADS AND BARS



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. . . for all precision boring machines.

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NEW Starrett® SAFE-FLEX®
HIGH SPEED STEEL BAND SAW

Cuts up to 10 times faster...with up to 30 times longer life

This is the new Starrett SAFE-FLEX® Band Saw — a *high speed steel* band saw that cuts up to 10 times faster, outlasts ordinary blades as much as 30 to 1. Engineered for higher speeds and heavier feeds to cut harder and tougher materials with ease and safety, it pays for itself over and over in lower cutting costs, longer tool life and substantial material savings.

Red-heat hardness even at temperatures up to 1100° F. keeps this new band hard and sharp. Graduated hardness gives it super-hard teeth and a super-tough back. Thinner section (.025″ to .042″) lets it cut faster with less power and less chip loss.

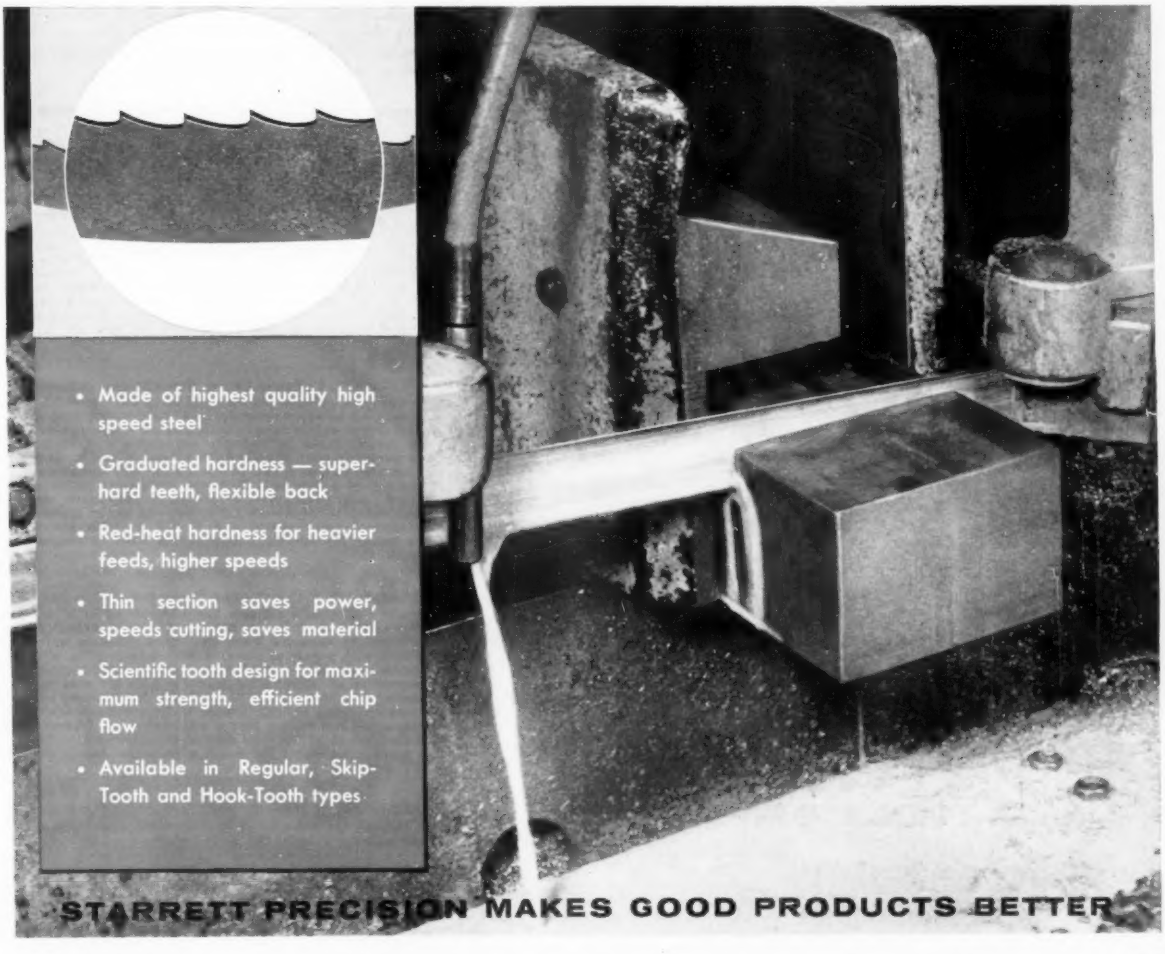
Your nearby Industrial Supply Distributor has this new Starrett SAFE-FLEX® High Speed Steel Band Saw in Regular, Skip-Tooth and Hook-Tooth types. Call him for quality products, dependable service — or write for complete information. Address Dept. E The L. S. Starrett Company, Athol, Mass., U. S. A.

Starrett

PRODUCTION-PROVED BAND SAWS

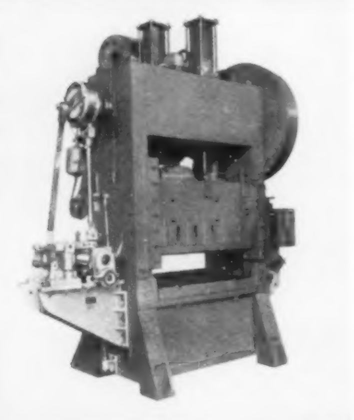
World's Greatest Toolmakers

SEE THIS NEW SAW AT THE TOOL SHOW
VISIT STARRETT BOOTH NO. 1401



Visit the U S PRODUCTS Booth 1554 at the A.S.T.E. Tool Show

We will exhibit, for the first time, 3 new additions to our line. These are:

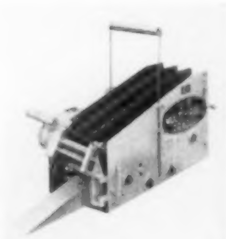


1 The Model ACR-1040 U. S. Motor-Driven Centralizing Stock Reel which uses the motor to mechanically expand and contract the cross members supporting the I.D. of the coil.

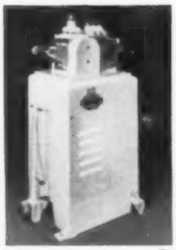
2 The Model RF-12-12 Style "B" U. S. Rack and Pinion Roll Feed displayed is suitable for material up to 12" in width by up to 3/16" thick and with feeding length adjustable up to a maximum of 12".

3 A completely redesigned U. S. Slide Feed —Model SF-68. This is suitable for material up to 6" in width. Feeding length is adjustable up to 8" at one stroke. In addition to features such as durability, versatility and accurate feed length for which U. S. Slide Feeds are recognized, this new model has a more positive check mechanism and will be quicker and easier to adjust.

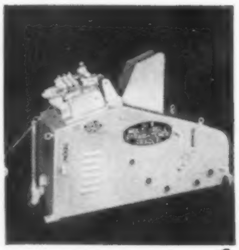
ALSO



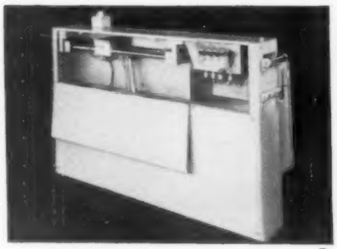
A



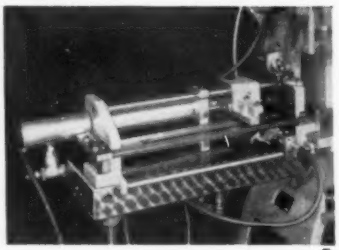
B



C



D



E

A ACC-1-9-C U. S. Multi-Roll Coil Cradle suitable for material up to 9" in width, O.D. up to 40", weight capacity 1,500 lbs. This Cradle is equipped with four power driven coil rest rolls, a pair of power driven take-out rolls (hinged for easy loading of coil), crank adjustable side plates for quick adjusting and centering to width of coil, micro switch loop control arrangement, adjustable time delay relay, and 1/3 HP geared motor for output speeds up to 80' per minute for operation on 220/440 volts, 3 phase, 60 cy. A. C.

B PDS-4½ U. S. Power Driven Straightener, cabinet-mounted type, suitable for material up to 4½" in width, thickness up to approximately 3/32". Arranged with a pair of power driven take-in rolls and six straightening rolls (upper three individually adjustable and lower three power driven). Straightener assembly is of hinged construction so that it can be opened for easy threading of the end of a new coil. Standard equipment includes forward, stop and reverse controls, indicators on straightening rolls, casters for portability, micro switch loop control arrangement and ¼ HP variable speed drive motor for operation on 220/440 volts, 3 phase, 60 cy. A. C.

C PDSC-948 U. S. Combination Power Driven Straightener and Coil Cradle suitable for material up to 9" in width, coils with O.D. up to 48", thickness capacity 3/32", weight capacity 2,000 lbs. Straightening unit arranged with a pair of power driven take-in rolls, six straightening rolls (lower three power driven), hinging arrangement on upper straightening rolls for ease in threading thin material or to facilitate the cleaning of the straightening rollers. Cradle to be arranged with five plain coil rest rolls, a pair of adjustable side frames. Including micro switch loop control arrangement, variable speed drive with 2 HP motor with output speeds 49 to 197' per minute.

D SFC-6-24 U. S. Motor-Driven Cabinet-Mounted Slide Feed suitable for material up to 6" in width and feeding length adjustable up to 24" at one stroke.

E Two ASF-12 U. S. Air-Operated Slide Feeds, open side type, mounted on press, one Feed to feed left to right and one front to back.

U. S. TOOL COMPANY, INC.

AMPERE (East Orange) NEW JERSEY

Ask for Bulletin No. 85-T


KENDEX TOOLING

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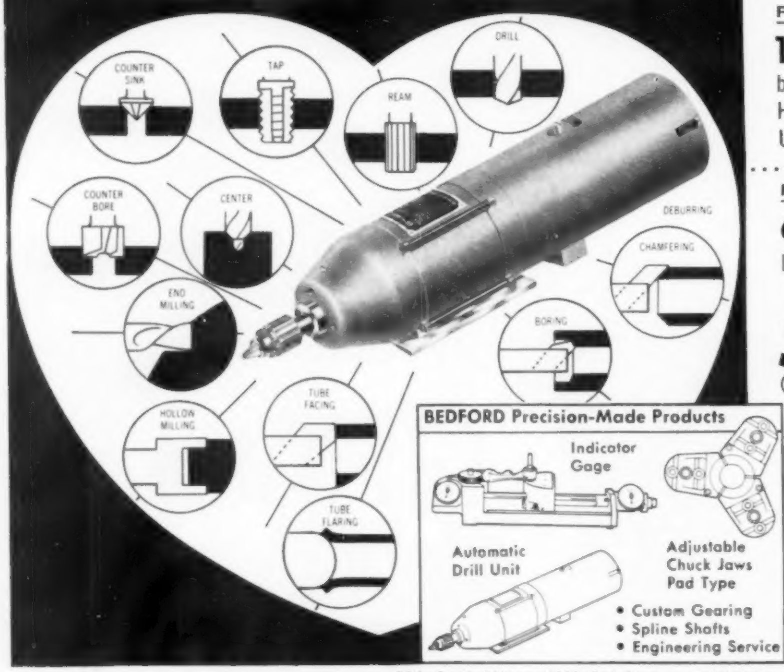

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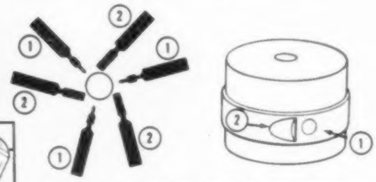

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Self-Aligning Bearings

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2	Chrome Moly Steel Ball and Race	For types operating under high radial ultimate loads (3000-893,000 lbs.).
3	Bronze Race and Chrome Moly Steel Ball	For types operating under normal loads with minimum friction requirements.

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BOOTH 1023

Write for Bulletin 56

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New SHEFFIELD *"Centerfind"*

Assures PRECISE ALIGNMENT for Jig Grinding or Boring

"Centerfind" enables an operator to align a work part hole precisely with the jig bore or jig grinder spindle axis.

A pressure-sensitive pick-up stylus is rotated by the spindle to tram the inner surface of the work part hole. As the stylus moves through its orbit, any change in pressure on it indicates misalignment and this is registered on the column Precisionaire. When the hole center is brought into precise alignment, the Precisionaire float remains stationary.

Checking is done while the spindle rotates, thus eliminating torque error which is a serious obstacle when alignment is attempted from a stationary spindle.

Because spindle-to-stylus distance approximates boring tool length, variations caused by vertical quill movement are minimized.

In addition to the reasons above, the high degree of accuracy obtainable with "Centerfind" is due to having only one moving part and the high amplification of the Precisionaire gage.

Other uses for this instrument are the checking of spindle runout and the squareness of a hole with its adjacent face.

"Centerfind" for checking holes up to 5" dia. is recommended to be used with Precisionaire Gages of 2000 or 5000 to 1 amplification. Higher amplifications and larger hole diameter capacity, when required.

For further information, write to The Sheffield Corporation, Dayton 1, Ohio, U.S.A., Dept. 19.

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A punched tape holds the basic formulae, the computer program. Variables for a particular Fellows Cutter, Shaving Tool, or Master Gear are typed on an electric typewriter which feeds them into the computer. As fast as the operator can type, the computer does the figuring which used to require hours of labor.

Fellows Gear Shapers tooled with Fellows Cutters lower costs and speed production on internal and external spur, helical and herringbone gears. Many examples of interest to designers are shown in the booklet, "The Art of Generating with a Reciprocating Tool." Just write any Fellows office for your copy.

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Cost cutting programs that start out with a conference and end up with a hatchet may save a dollar today and cost ten tomorrow.

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These ingenious electrically (or mechanically) controlled, air-powered work units can be easily installed on your existing machinery, or in combination with such standard items as brackets, switches, etc., can be made into low cost special purpose machines. When one run is over they can be easily dismantled and re-assembled to do another job.

Yes, when it comes to cutting costs Bellows Air Motors are a production man's best friends. They put practical automation within easy reach of every plant in every industry.

Would you like to see a file of cost cutting ideas other companies have developed using Bellows Air Motors? Write Dept. TE-458, The Bellows Co., Akron 9, Ohio.
In Canada: Bellows Pneumatic Devices of Canada, Lt., Toronto 18

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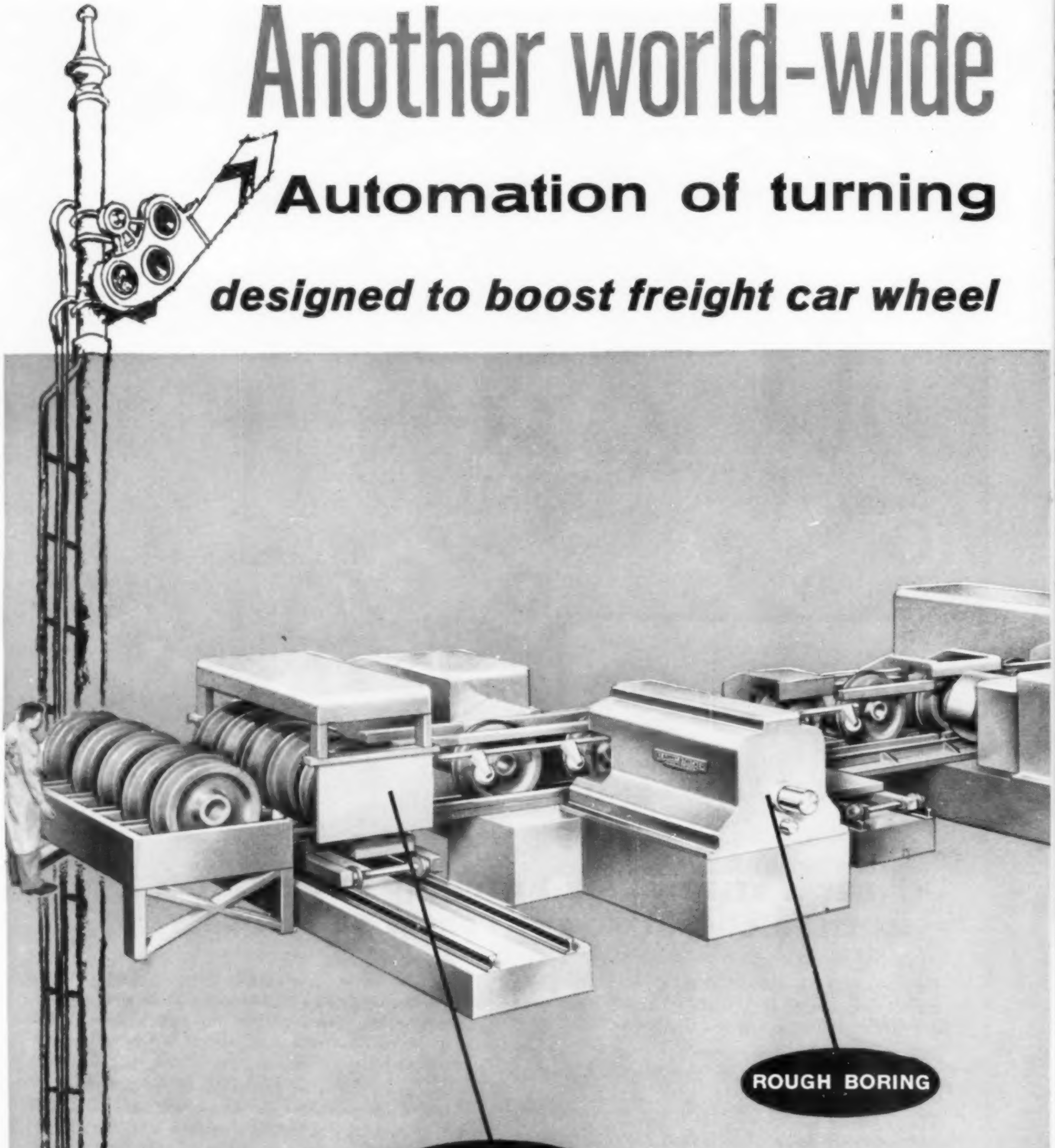

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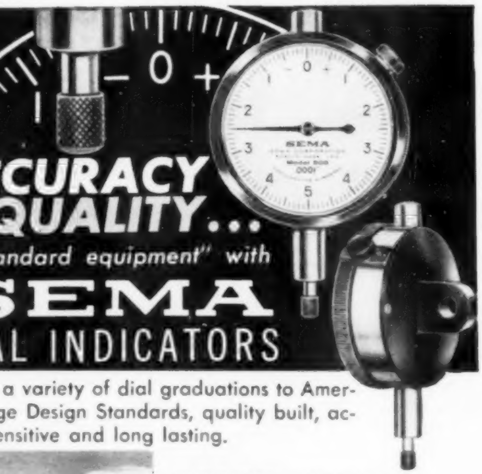

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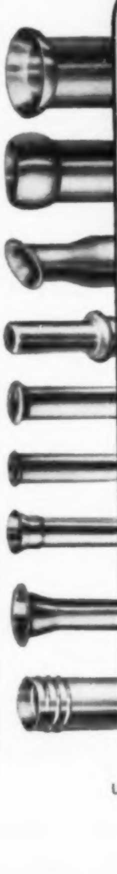

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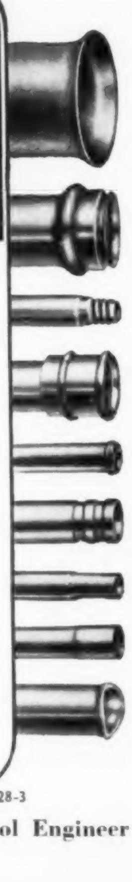

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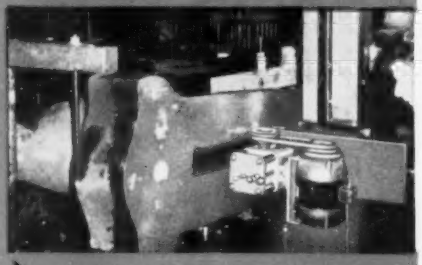

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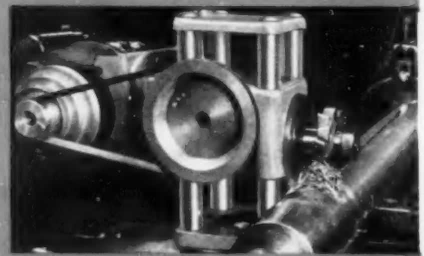
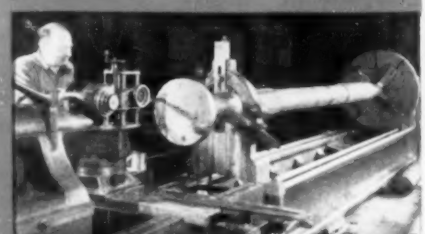


SLOTTING 42"-LONG ON A LATHE



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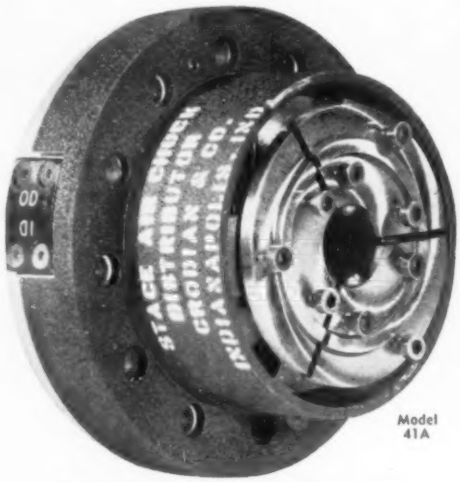

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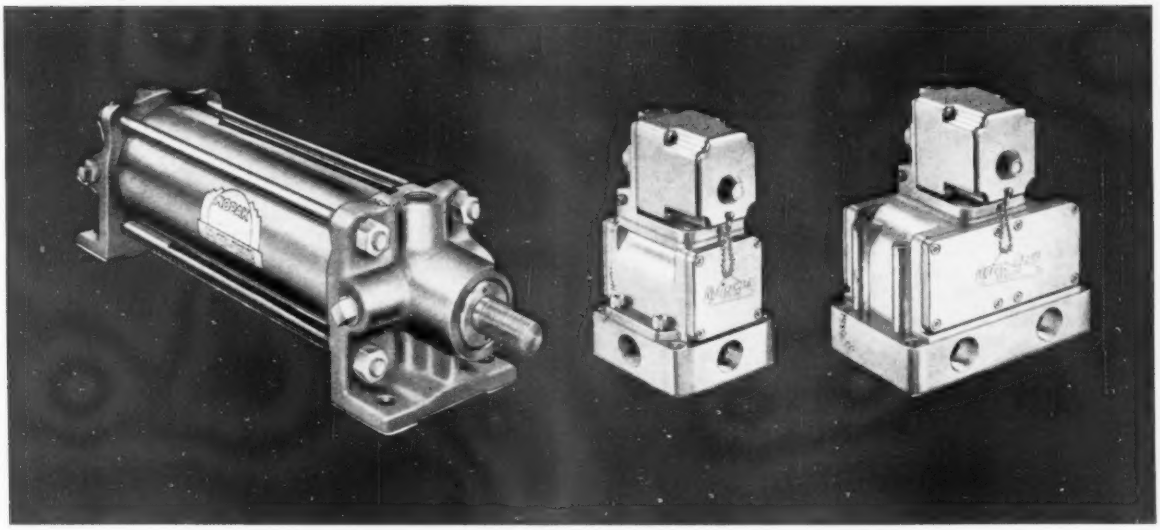

When you specify . . . specify Nopak Valves and Cylinders and you are assured of efficient, low-cost performance that will confirm your good judgment through many years of trouble-free service—even under severe working conditions. The wide selection of Nopak air and hydraulic products meets your fluid power requirements.

A Great Team! Nopak Air Cylinders are being used to great advantage with the new Nopak-matic, Pilot Operated, Air Control Valves. Together they have proved a great team in many successful "in plant" and O.E.M. applications. Send for Nopak Catalogs 101 and 105 for complete engineering and application data.

NOPAK Class 1 and 2 Air Cylinders are available in 7 standard mountings in bore sizes from $1\frac{1}{2}''$ to $14''$ with a choice of non-cushioned, self-regulating or adjustable cushioned heads on all models. Class 1 Cylinders, in most standard sizes, are available from Shelf-stock at the factory and other convenient locations. Write for Shelf-stock listings.

Nopak-matic Valves — Nopak-matic, Pilot-operated Poppet-type Air Control Valves are available in $\frac{1}{4}''$, $\frac{3}{8}''$, $\frac{1}{2}''$ and $\frac{3}{4}''$ pipe sizes for 2- or 3-Way normally open or normally closed operation, and 4-Way operation. Master (air), single or double solenoid control heads interchangeable on all models. All valves available, as standard, with choice of side or bottom ported sub-plates. Air pressures to 150 p.s.i.

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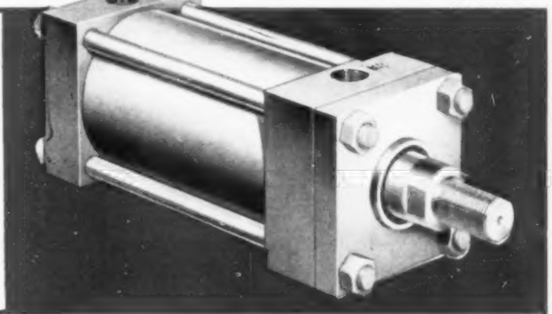
Hydraulic Cylinders give you quality, delivery, price, and complete interchangeability with most units of this type. This new line of Nopak Hydraulic Cylinders offers a complete selection of standard mounting styles (15) plus many combinations; a complete range of bore sizes ($1\frac{1}{2}''$ thru $8''$); operating pressures to 2000 p.s.i. and 3000 p.s.i. non-shock; proven design and construction.

Investigate the advantages — you'll specify NOPAK Square Head Hydraulic Cylinders! Send for Catalog 103.



See us at the Tool Show, Philadelphia, May 1-8, Booth No. 834

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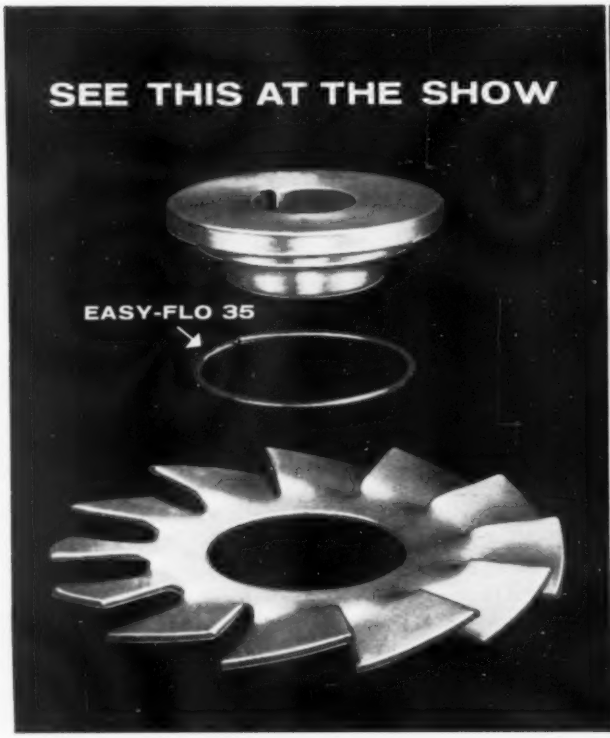

See for yourself how Black & Decker Silver Brazes Fan Assemblies: HANDY & HARMAN will show you how

at the Design Engineering Show—Chicago—April 14-17
and at the Tool Show—Philadelphia—May 1-8

Right now, we can only tell you – in text and pictures – how this power tool company brazes this assembly on a simple brazing machine.

The assembly, consisting of a steel hub and a blade, is used in Black & Decker portable drills as a cooling fan. Its basic simplicity easily lends itself to the continuous heating method devised by Black & Decker. A vital requirement is great joint strength; this is an inherent quality of silver brazing.

The fan, hub and Easy-Flo 35 and Handy Flux are the production essentials. One operator assembles and fluxes the parts and places them on a conveyor which carries the assemblies under a bank of burners. One assembly is brazed every few seconds.

This is an excellent example of how silver alloy brazing, coupled with production inventiveness, can accomplish production in mass at great speed. It is very possible that your metal-joining problems can be solved just as swiftly and simply.

If you plan to be at either of the shows mentioned above, you will see this operation in full swing. Handy & Harman will demonstrate this application, with some advanced heating procedures. We invite you to look in on the "simple speed" of silver brazing.

Meanwhile, we welcome any questions or problems on the joining of metals. We have found that, very often, a simple question on a metal-joining problem leads to multi-benefit answers through silver alloy brazing.

FIRST, BULLETIN 20 – This informative booklet will get you off to a good start on the values, techniques and economies of low-temperature silver brazing. A copy awaits your request.

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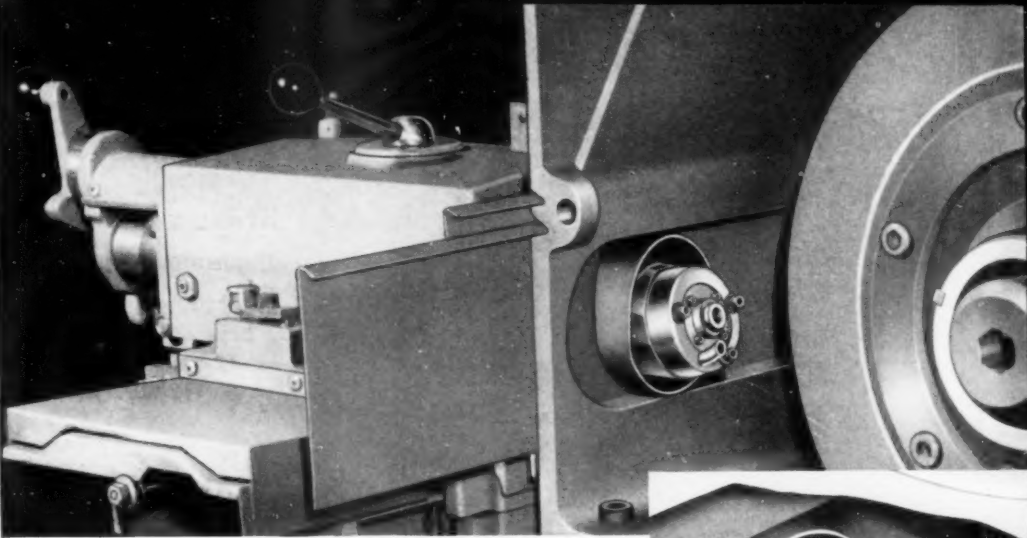
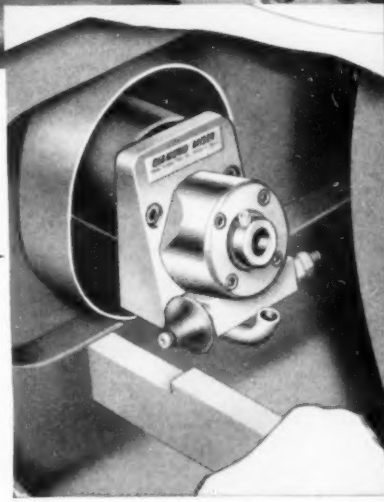


↑ **Hydraulic Diamond-Miser DM 1587** • For the new Cincinnati Filmatic No. 2 Centerless Grinder (LO Model). Easy installation. Uses normal hydraulic circuit in machine to automatically index diamond tool on EITHER side of wheel.

Mechanical Diamond-Miser DM 1092, Plunger Operated • For the No. 2 Cincinnati Centerless Grinder (LO Model). Easy installation by drilling 2 holes in grinding wheel housing cover. Adjustable to any width wheel. Models available for EA and OM Cincinnati Centerless Grinders. →



You Cut Grinding Costs Automatically with Wheel Trueing's Diamond-Misers

The Diamond-Miser helps you to save on grinding in three ways—by cutting diamond costs—by cutting wheel costs—by eliminating down time for diamond turning.

The Hydraulic Diamond-Miser (above) connects to the hydraulic system of centerless, cam, crank or universal grinders (single or multiple wheel mounts) and indexing automatically provides multiple, accurately-metered diamond facets which are re-sharpened in each pass of the wheel. The built-in concentricity of the Wheel Trueing Diamond Tools is automatically maintained. The Mechanical Diamond-Miser (above, right) indexes through contact of a plunger and bracket at each pass.

Because metering is accurate, there is controlled minimum wear on both diamond and wheel. Dressings are uniform; the wheel much sharper.

The savings on diamonds, on wheels and in time add up to important savings on grinding costs. And, because the whole process is automatic, never forgotten, never neglected—savings, too, are automatic.

Perhaps you can use such savings in your own processes. Would you like to talk with one of our field engineers? May we send you our descriptive booklet?

WHEEL TRUEING TOOL COMPANY

36-3200 W. DAVISON AVE., DETROIT 38, MICHIGAN

ESTABLISHED 1910

Southwestern Plant: Dallas, Texas

Distributors in Principal U.S. Cities—Agents Throughout the World

WHEEL TRUEING TOOL COMPANY OF NEW JERSEY
33 West Street, Bloomfield, N. J.

WHEEL TRUEING TOOL COMPANY OF CALIFORNIA
5560 Alhambra Ave., Los Angeles 32, California

WHEEL TRUEING TOOL COMPANY OF CANADA, LTD.
575 Langlois Ave., Windsor, Ont.

Do your machines have a Built-in Future?

When you buy new hobbing machines, gear your thinking to the future.

It is not enough just to meet today's production requirements. The machines you buy now must have "built-in" features that will measure up to the high-speed production demands of tomorrow.

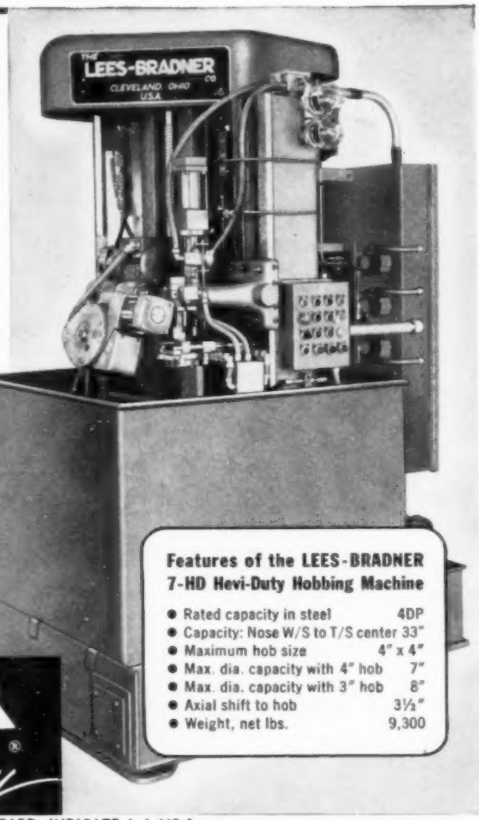
The Lees-Bradner Company manufactures a complete line of hobbing machines designed to fulfill varied requirements.

For example, this 7-HD Hevi-Duty Single Spindle Hobbing Machine is built to hob *today* at *tomorrow's* higher feeds and speeds. It's a heavy, powerful machine equipped with a new hob head featuring an axial shift of 3½ inches.

The 7-HD is also available in 4 and 6-spindle rotary models.

For complete technical information on Lees-Bradner "years ahead" Hobbing Machines send for your free 7-HD brochure . . . or contact the Lees-Bradner representative in your area.

IF YOU THREAD OR HOB . . . GET A BETTER JOB WITH A LEES-BRADNER



Features of the LEES-BRADNER 7-HD Hevi-Duty Hobbing Machine

- Rated capacity in steel — 4DP
- Capacity: Nose W/S to T/S center 33"
- Maximum hob size — 4" x 4"
- Max. dia. capacity with 4" hob — 7"
- Max. dia. capacity with 3" hob — 8"
- Axial shift to hob — 3½"
- Weight, net lbs. — 9,300

the LEES-BRADNER Company®

CLEVELAND 11, OHIO • U.S.A.

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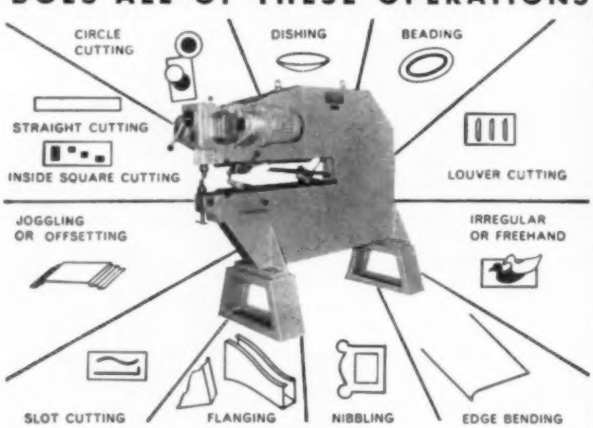
A Complete Sheet Metal Shop in One Machine

PULLMAX

DOES ALL OF THESE OPERATIONS



★ CUTS MILD STEEL UP TO $^{11}/_{32}$"

The one machine that's sure to save time, labor and material when you work sheet or plate. Eliminates expensive die costs—easy to operate. 7 sizes to choose from.

Write for a demonstration right in your plant.

Write for free catalog on Metalworking Ideas.

AMERICAN PULLMAX CO., INC.

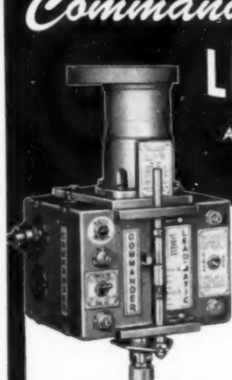
2451 N. Sheffield Ave., Chicago 14, Illinois

USE READER SERVICE CARD; INDICATE A-4-442-2

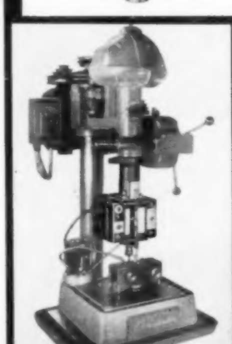
Commander LĒAD-MATIC *Tapper*

Automatic Tapper with Lead Screw

FOR HIGH PRODUCTION PRECISION TAPPING



- Precision Ground Lead Screws Assure Finest Threads
- Electrically Controlled Cycle or Jog Tapping Action
- Hand, Foot or Fixture Switch Control
- Easily Adapted to Any Drill Press
- Range #0 to ¾"



Built for high production tapping . . . precision or otherwise, the Commander Lēad-Matic Tapper makes any drill press a precision tapping unit, even with inexperienced operators. Electric control of Cycle or Jog tapping action provides versatility to handle any job . . . automatic tap reversal eliminates drill press motor reversing and speeds tapping. Compact, ruggedly built, easy to operate, the Commander Lēad-Matic Tapper will cut your tapping costs and reduce rejects to a minimum.

Write for illustrated circular and name of nearest Distributor.

***Commander* MFG. CO.**

4213 W. KINZIE ST. • CHICAGO

PRODUCT OF COMMANDER . . . BUILDER OF PRODUCTION TOOLS

See us at Booth #945 ASTE SHOW

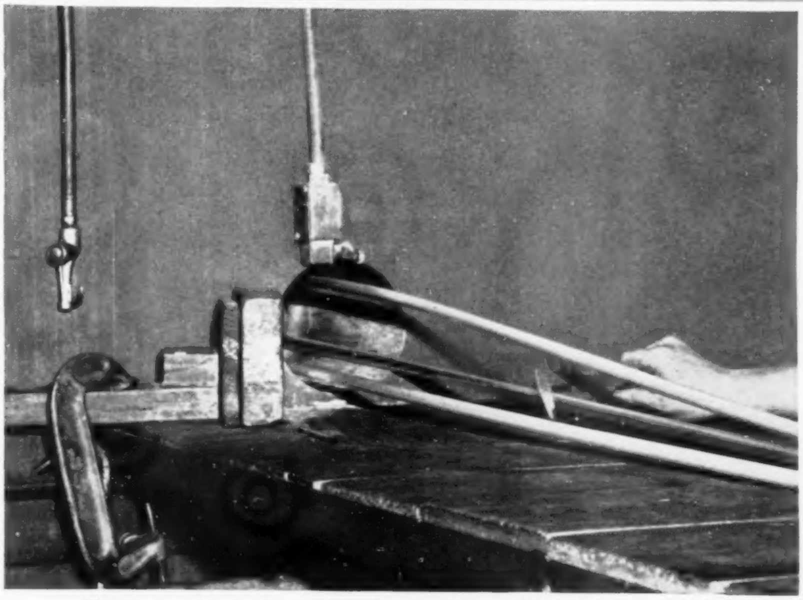
USE READER SERVICE CARD; INDICATE A-4-442-3

Tool Steel Topics

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Export Distributor: Bethlehem Steel Export Corporation



Showing extrusions leaving the press. The die of Cromo-WV tool steel is not visible.

Die made from Cromo-WV passes tough extrusion test

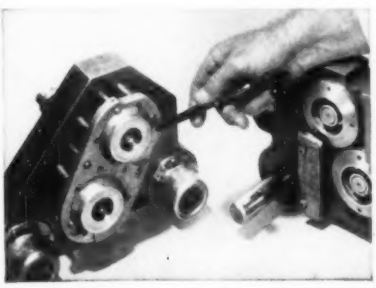
Quality plus economy — that's the kind of a die steel they needed at American Aluminum Extruders, Miami, Fla., to produce aluminum extrusions used as decorative trim. Our local tool steel distributor, J. M. Tull Metal & Supply Co., Inc., recommended Bethlehem Cromo-WV.

"We've had a lot of experience with this grade," they said. "Give it a try, and the performance figures will speak for themselves."

That's just the way it turned out. Cromo-WV was satisfactory in every way. Hardened to Rockwell C-47, the die extruded about 2,500 lb of aluminum before polishing was required.

Cromo-WV, in addition to its 5 pct chrome, contains .30 pct vanadium. It is a modification of our popular Cromo-W, the original 5 pct chrome hot-work steel. Like Cromo-W, it combines red hardness, shock resistance, and resistance to heat-checking. It is an ideal grade for extrusion work.

Your Bethlehem tool steel distributor will be pleased to supply Cromo-WV, whether you want a production quantity or just enough to give it a trial.



IT'S TOPS FOR BOTTLE CAPS

Here's a die made of BTR (Bethlehem Tool Room) which was used in producing millions of tinplate bottle caps. The die was hardened to Rockwell C-61, and was redressed about every third month. BTR is our general-purpose manganese-chromium-tungsten grade of oil-hardening tool steel. Tough, and safe-hardening, you can count on it for extremely long wear.

BETHLEHEM TOOL STEEL ENGINEER SAYS:

In Machining Operations, Chips Tell a Story

A good way to evaluate a machining operation is to examine the chips carefully. This step is particularly valuable in operations where large amounts of metal are removed at high speed.

Generally, the color and shape of the chips tell a story which, when properly interpreted, can lead to improvements in the operation. For example, when machining with high-speed steel tools, the chips produced should show some temper color (yellow or brown). If they do not, it means that speed and feed might be increased greatly, boosting the production rate on the machine. When machining with carbide or ceramic tools, the chips should always be highly temper-colored (purple or blue). If otherwise, you are probably "under-machining."

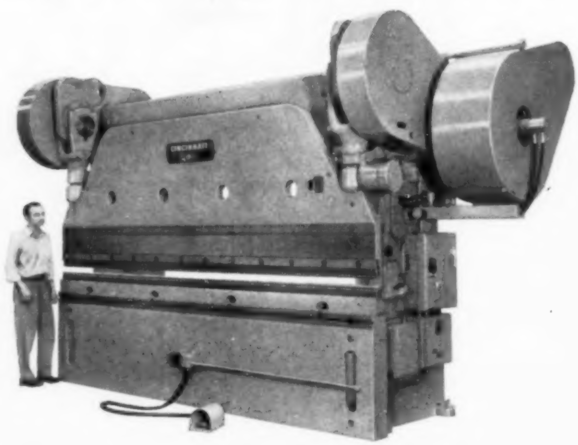
The shape of the chips will vary with the type of steel being machined, but comparison of chip shape under varying conditions may provide valuable information. The ideal chip shape, indicating ideal machining conditions, is like the letter "C." Often the "C" can have a decided flourish, but this form of chip (on steel) is best. Generally, the secret of producing "C" chips lies in the proper balance of feed and depth of cut, versus speed. These factors should be varied whenever other types of chips are produced, to develop the best machining conditions.

Examination of chip shape is also of value for control purposes. For example, if "C" chips are being produced in a machining operation, and they become gradually longer or stringy, it indicates the tool is becoming dull, and requires resharpening.

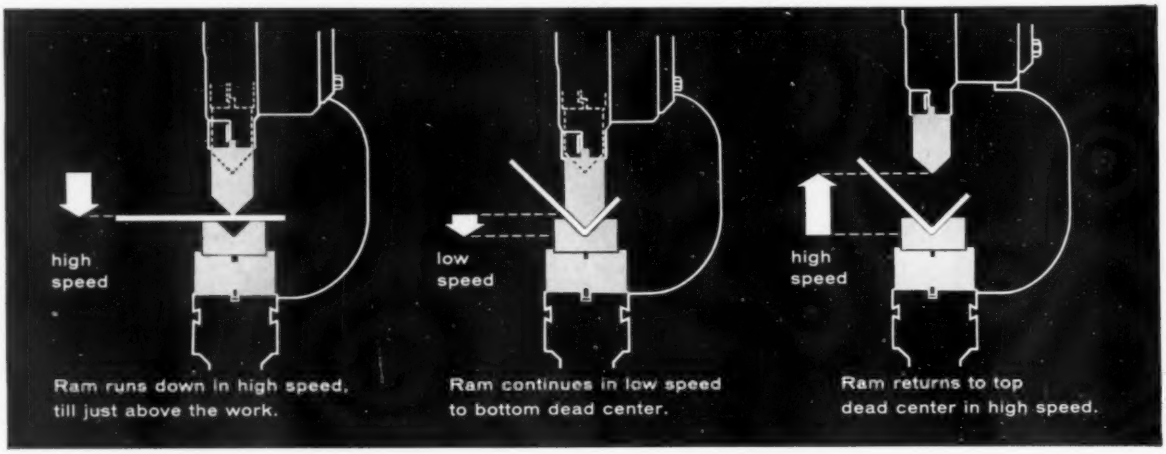
It is difficult to establish more specific rules which apply to all machining operations, due to their variety and complexity. However, you can be sure that the proper control of chip color and shape will pay off in increased production.

10 to 60% increase in production

CINCINNATI AUTOCYCLE



the most important press brake development in years!



Cincinnati Autocycle is a brand new feature which automatically provides two speeds to the ram for each stroke. It eliminates the "whip-up" of a sheet's free end that occurs when light gauge metal is formed over a small die opening at high speed.

Unlike previous attempts at reducing whip-up, the Autocycle does not slow down the entire stroke of the press brake's ram. Nor does it require clutch slipping, which depends entirely on operator skill and at best is unreliable.

Think what these advantages can mean for you:

1. Actual job records show 10% to 60% increase in parts produced per hour.
2. You can set the length of the low-speed working portion of the ram stroke. Once this is set, all strokes are identical, which insures absolute consistency in the work.
3. Work spoilage (such as back bends caused by whip-up) is eliminated.
4. Highly experienced operators are not required.
5. Operator fatigue is greatly reduced by eliminating clutch slipping.
6. Clutch and brake are long-life, minimum-maintenance units requiring no adjustments.

This productive new feature is available now on all 7 and 9 Series Cincinnati Press Brakes.

Get the full details about the Cincinnati Autocycle in Bulletin B-9. Address your request to Department A.

Shapers / Shears / Press Brakes

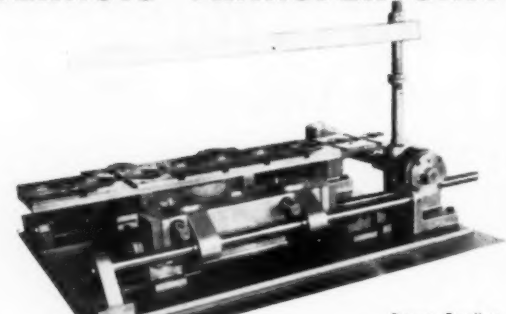
THE CINCINNATI SHAPER CO.

Cincinnati 11, Ohio, U.S.A.

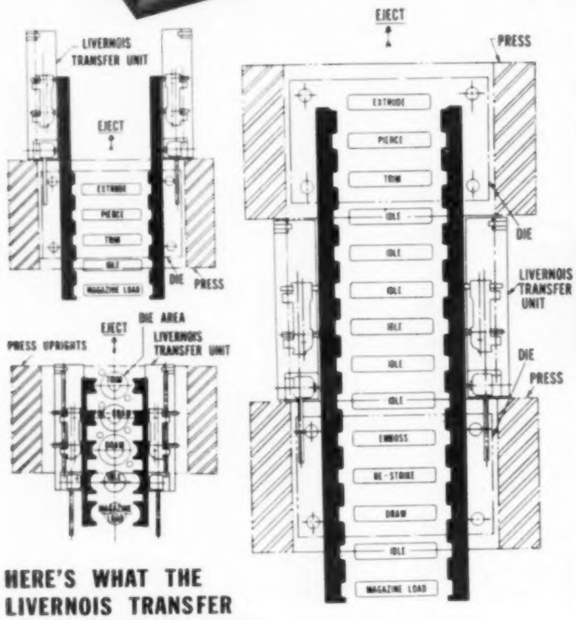
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-4-444

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-4-445

Get Efficient Automation with
LIVERNOIS TRANSFER UNITS



Patent Pending



HERE'S WHAT THE LIVERNOIS TRANSFER UNIT WILL DO FOR YOU:

- Lower Die Costs
- Reduce Labor Cost
- Less Maintenance
- Save on Material
- Increases Production — with fewer presses

OTHER FEATURES:

NEAT — COMPACT — FOOL-PROOF — ADJUSTABLE — RUGGED CONSTRUCTION — LIGHT WEIGHT — FLOATS ON BALL BEARINGS.

The Livernois Transfer Unit is a completely mechanical device without any electrical, pneumatic or hydraulic aids. Automation is attained entirely by movement of the rams.

See our display at the ASTE Tool Show — in Philadelphia, May 1 thru 8, in Booth 923 in Los Angeles, September 29 thru October 3, in Booth 711.

VISIT OUR BOOTH '58 ASTE TOOL SHOW

In addition — why not pay us a visit at our plant anytime and see the Transfer Unit in operation.

CR. 8-0200

LIVERNOIS ENGINEERING Co.

25200 Trowbridge, Dearborn, Michigan

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SAWS for the PRICE of

... use the WELLS 49A for Horizontal Cut-off and Vertical Band Sawing

The Wells 49A is a dual-purpose machine designed for shop or "job-site" work. As a horizontal cut-off saw, the 49A has a capacity of 3½" x 6". Swing the head to vertical position . . . it's an upright band saw. No tools required! Use it for cutting angles, slots, notches, bevels and light contour work.

The 49A can save time and money for you. Let your local Wells Distributor show you how . . . or write direct for complete information.

Wells

The Pioneers of Horizontal

METAL CUTTING BAND SAWS

WELLS MANUFACTURING CORPORATION
600 Service Road, Three Rivers, Mich.

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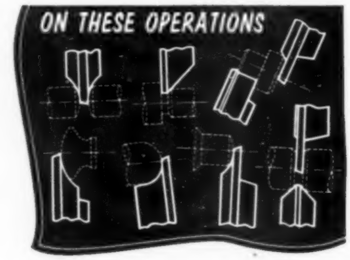
SOMMA STANDARD

circular form tools

MAKE MORE PROFIT



Now you can save time and money on a wide variety of form tool operations by replacing costly made-to-order or hand ground tools with Somma Standard Circular Form Tools.

In addition you are assured of uniform accurate dimensions every time, easier setups, and a better finish on the parts.

And Somma Standard Tools are available through the Somma representative in your area. • Write for new catalog and price list of standard tools and blanks.

Somma TOOL CO., INC.

106 Scott Rd., Waterbury, Conn.

West Coast Warehouse: 576 N. Prairie, Hawthorne, Cal.

USE READER SERVICE CARD; INDICATE A-4-446-3

New driver jumps production 200% solves tap breakage problem conclusively

Friction-free release assures reliable operation ...no more slowdown for blind holes!

The picture at the right shows a typical application of a tool which is breaking all records for breakage-free tapping—Scully-Jones' new patented *reversible* "Safe-Torque" tap driver.

To neutralize the common causes of tap failure, step up machine speeds, and control the quality of threads to new standards of accuracy, a tap driver that is more than an overload clutch is needed. That's why we have developed this new "Safe-Torque" tap driver to incorporate three very important principles:

1. Overrunning roller drive that is either full-*on* or full-*off*.
2. Friction-free release that eliminates heat, noise, and impacting.
3. Spring-tension collet that floats the tap *in* and *out* of the hole.

Here's how these three principles work to bring tapping up to new production standards.

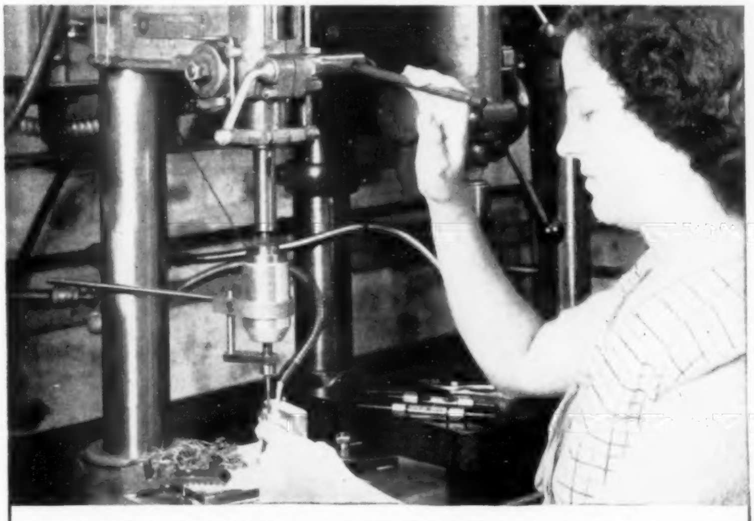


Fig. 1. Breakage Banished—On a run of 20,000 blind holes requiring 75% thread, not one tap was broken on this high-speed tapping operation. Spindle speed was increased three times. Positive torque control and ability of the tap to lead itself helped eliminate rejects completely.

Releases instantly and completely at the right torque every time

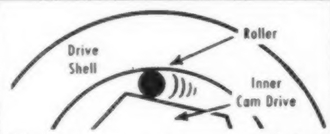


Fig. 2. When tapping torque exceeds the preset torque, rollers overrun high points on the cams and lock in a free position. Then no torque is transmitted to the tap.

In forward drive, rollers transmit the driving torque, and are wedged between the inside wall of the drive shell and high points on the inner cam drive. In the wedged position they transmit torque. If tapping torque exceeds the preset torque of the driver, the rollers overrun the high points on the cams and lock in a free position. Then the driver is freewheeling and no torque is transmitted to the tap.

Torque settings, below the break strength of the tap, are made by rotating the adjusting ring on the driver to move the entire roller mechanism in or out of the tapered drive shell surrounding the rollers. This movement (in for higher torque, out for lower torque) changes the clearances between the rollers located between the driving shell and the inner cam drive.

You can see how sliding friction has been ruled out of the design of this releasing mechanism. All contacting driving members roll on each other. Thus, there is no heat to expand moving parts. Release torque remains constant once set for the tap and the job. And the tap driver releases instantly and completely at the right torque every time.

Freewheeling release, no vibration or heat

When the "Safe-Torque" mechanism overruns, the rollers lock in a free position. Then, the drive shell revolves *freely* on anti-friction bearings and transmits no torque to the tap. The driver runs cool, assuring reliable operation, preventing stripping of threads, and reducing maintenance costs. This builds operator confidence, permitting him to tap at high speeds without fear of tap breakage even when bottoming in blind holes.

The operator simply withdraws the spindle after reaching depth, and the gear-type reversing mechanism removes the tap without change of spindle rotation.

Tension spring floats tap in and out of hole

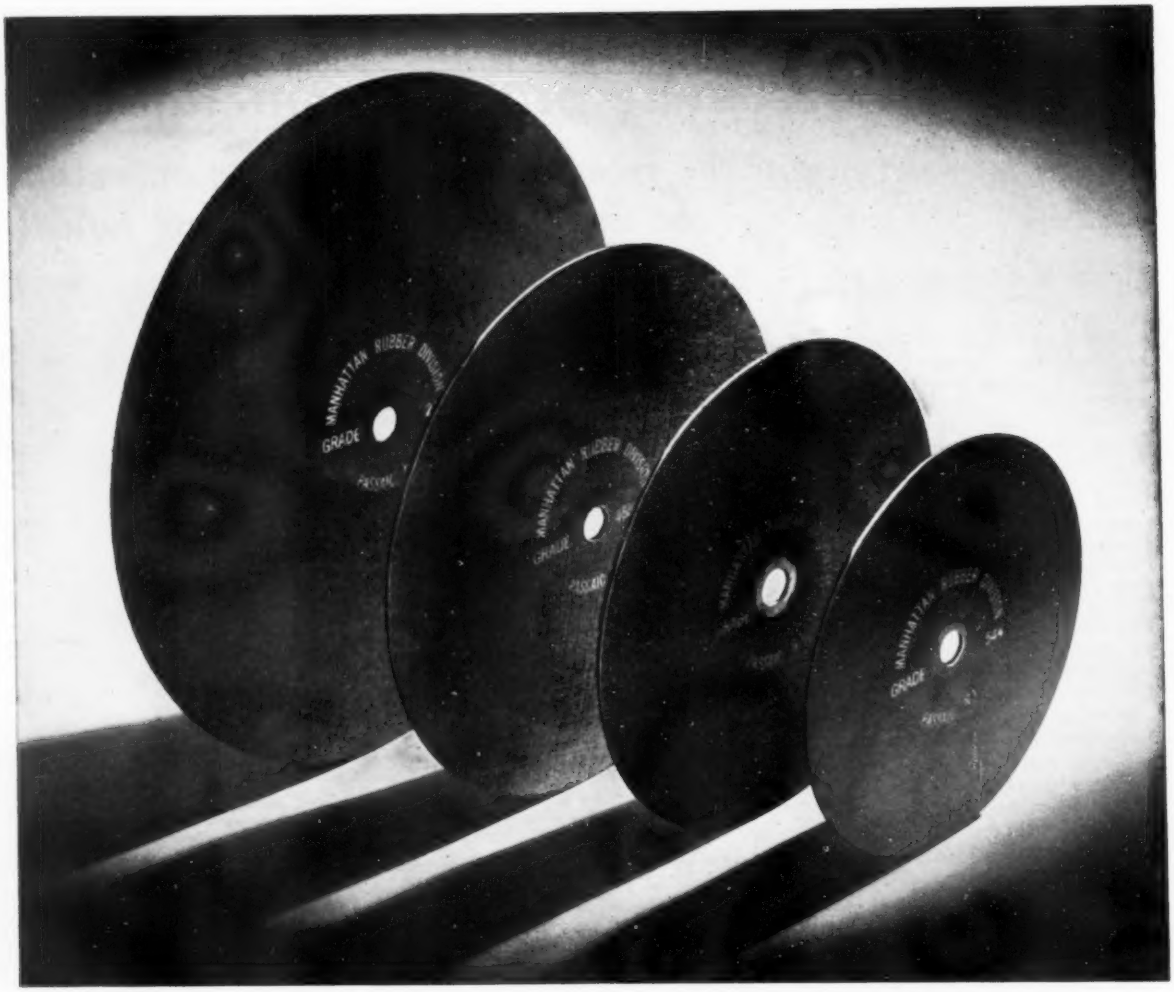
Once engaged, the tap follows its own lead because the tension spring in the driver collet allows the tap to float in and out of the hole. And when reversed, the tap jumps away from the last thread. Thus, the tap cannot distort the threads. This axial float effectively compensates for operator inexperience and helps produce more uniform, accurate threads.

Get free demonstration on your "problem" job

Your Scully-Jones representative or distributor has a sample reversible "Safe-Torque" tap driver with him, and can make a demonstration on your "problem" tapping job. Look for his telephone number in the yellow pages, or write us. We have a new booklet describing the "Safe-Torque" tap driver in complete detail—ask for supplement to Bulletin No. 20-50, and address your letter to Scully-Jones and Company, 1915 S. Rockwell Street, Chicago 8, Illinois.

SCULLY JONES **PRECISION HOLDING TOOLS**

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-4-447



Cleaner Cutting — Longer Life

MANHATTAN CUT-OFF WHEELS

Recent Manhattan developments in rubber and resinoid bonds have greatly increased the cutting efficiency and service life of Manhattan Cut-Off Wheels. That's because *every* wheel is custom-bonded for your particular cut-off operations . . . on hardened steel, soft steel, light gauge tubing or critical alloys. Factory records of the number of cuts per wheel have proved they last longer than other wheels . . . and proved they cut cleaner and cooler.

Manhattan Cut-Off Wheels are made to your order in the widest range of types and sizes. Manhattan sales engineers are prepared to assist you in determining the best one for your job. Let a Manhattan Abrasive Wheel engineer show you how you can save time and money — get "More Use per Dollar" . . . with Manhattan Cut-Off Wheels and other types of high speed, heavy duty wheels at your plant.

RM 842

WRITE TO ABRASIVE WHEEL DEPARTMENT

MANHATTAN RUBBER DIVISION — PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

Belts • Hose • Roll Covering • Tank Linings • Industrial Rubber Specialties • Abrasive and Diamond Wheels • Brake Blocks and Linings • Clutch Facings • Asbestos Textiles • Mechanical Packings • Engineered Plastics • Sintered Metal Products • Industrial Adhesives • Laundry Pads and Covers • Bowling Balls

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TRADE LITERATURE CURRENTLY OFFERED BY THE TOOL ENGINEER ADVERTISERS

A-4-247—End Mills—*Putnam Tool Co.* Catalog 457 gives complete information on Putnam end mills for aluminum. (Page 247)

A-4-377—Threading Tools—*R and L Tools.* New catalog describes the R and L tap and die holder. (Page 377)

A-4-373—Nutsetters—*Cleco Division, Reed Roller Bit Co.* New Multiples Brochure MS-358 describes production application of Cleco 8-spindle nutsetters. (Page 373)

A-4-307—Thread Rolling Machines—*Reed Rolled Thread Die Co.* Machine Bulletin B 111-1 describes new horizontal type thread rolling machine. (Page 307)

A-4-284—Punches and Dies—*Ring Punch & Die, Inc.* Illustrated Catalog 105 shows standard and special punches, dies and punch and die retainers. (Page 284)

A-4-252—Angular Tooling—*Omer E. Robbins Co.* Complete range in models of "Magna-sine" inspection sine plates and heavy-duty sine plates shown in new catalog. (Page 252)

A-4-308—Clutches—*Rockford Clutch Div. Borg Warner.* Bulletin shows typical installations and applications of Rockford clutches and power takeoffs. (Page 308)

A-4-388-1—Taps—*Royco Tap and Tool Corp.* Catalog No. 27 describes Royco Tap line. (Page 388)

A-4-410—Toolholders—*Coromant Div. Sandvik Steel, Inc.* Free booklet covers various T-Max styles and data on carbide inserts. (Page 410)

A-4-467-2—Optical Tooling—*George Scherr Co., Inc.* Illustrated folder shows inspection by auto-collimation with the new Opto tooling. (Page 467)

A-4-45—Machine Tools—*Seewald, Inc.*—Free booklets describe the VDF lathes, deep hole boring machines, tube turning lathes, bevel gear generators and planers. (Pages 44-45)

A-4-428-1—Inspection Equipment—*Sema Corp.* New bulletins describe Sema dial indicators and Ames portable hardness testers. (Page 428)

A-4-223—Lathes—*Seneca Falls Machine Co.* New idea album "Multiple Tool Turning Ideas" shows many tooling layouts for production machining of parts. (Page 223)

A-4-264—Press Equipment—*Sesco Inc.* Catalog shows specifications of gripper feeds, straighteners, reels and coil handlers. (Page 264)

A-4-350-3—Cutting Tools—*Silber Products, Inc.* Technical literature describes the new Relievomatic cutting tool for boring, turning or facing. (Page 350)

A-4-221—Diamond Tools—*J. K. Smit and Sons, Inc.* Details on diamond tools available in new catalog. (Pages 220-221)

A-4-446-3—Form Tools—*Somma Tool Co., Inc.* New catalog and price list shows standard circular form tools and blanks. (Page 446)

A-4-420-2—Bearings—*Southwest Products Co.* Revised engineering manual describes complete line of "Monoball" self-aligning bearings. (Page 420)

A-4-290—Chucks—*Speedgrip Chuck.* Manual No. 11 contains general information on Speedgrip collet chucks. (Page 290)

A-4-400—Gages—*Standard Gage Co., Inc.* New Check Master bulletin contains information on indicator gages. (Page 400)

A-4-332—Fasteners—*Standard Pressed Steel Co.* The new SPS booklet "Concerning High Reliability" contains information on the full meaning of reliabilty. (Page 332)

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A-4-249-2—Cutting Tools—*Starlite Industries, Inc.* Free catalog describes Starlite diamond point and Starbide carbide and standard and special tools. (Page 249)

A-4-392—Milling Machine—*Sundstrand Machine Tool Co.* Bulletin No. 790 describes Sundstrand's new C Model Rigidmils (Page 392)

A-4-54—Carbide Tools—*Super Tool Co. Div. Van Norman Ind.* New catalog shows complete carbide tool line of milling cutters, tool bits, drills and reamers. (Page 54)

A-4-271—Parts Feeders—*Syntron Co.* New catalog shows complete Syntron line of production equipment. (Page 271)

A-4-311—Dust Collector—*Torit Mfg. Co.* Details and full specifications available on new Torit diamond dust collector. (Page 311)

A-4-344—Tool Steel—*Uddeholm Co. of America, Inc.* Tool steel stock list No. 12 gives information on Uddeholm's complete selection of Swedish-quality tool steels. (Page 344)

A-4-241—Microscope—*Unitron Instrument Div. of United Scientific Co.* Catalog gives complete information on Unitron microscope. (Page 241)

A-4-372—Drill Heads—*United States Drill Head Co.* Catalog AD-57 gives specifications on U. S. universal joint drill heads. (Page 372)

A-4-454—Filtration System—*Industrial Filtration Div. U. S. Hoffman Machinery Corp.* Bulletin A690 gives information on Hoffman Flotation units. (Page 454)

A-4-355—High Speed Steel—*Vanadium-Alloys Steel Co.* Technical data sheet available on Vasco M-2 and free machine (FM) grade. (Page 355)

A-4-230—Hack Saws—*E. H. Wachs Co.* Free blade tensioning chart describes the new simplified counted turn method for tightening blades on power hacksaws. (Page 230)

A-4-315—Grooving Tool—*Waldes Kohinoor, Inc.* Twenty-page manual contains full information on Waldes Truarc grooving tool. (Page 315)

A-4-476-3—Jig and Fixture Components—*West Point Mfg. Co.* New catalog describes toggle clamps, fixture clamps and parts. (Page 476)

A-4-437—Diamond Tools—*Wheel Trueing Tool Co.* New catalog describes toggle clamps, fixture clamps and parts. (Page 437)

A-4-338-1—Adjustable Dies—*S. B. Whistler & Sons, Inc.* New catalog describes adjustable die-making method for perforating dies. (Page 338)

A-4-359—Reamers—*Whitman & Barnes.* New literature available on reamers. (Page 359)

A-4-240—Spindles—*Whitnon Mfg. Co.* New literature describes Whitnon high-frequency electric spindles. (Page 240)

A-4-229-2—Tube Mills—*Yoder Co.* Fully illustrated 88-page Yoder Tube Mill book describes the advantages of operating a Yoder pipe or tube mill. (Page 229)

A-4-470-2—Toolholders—*W. M. Ziegler Tool Co.* Catalog roller drive floating toolholders is available. (Page 470)

FOR ADDITIONAL LISTINGS SEE PAGES 267-268

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SEE all other illustrated machines in operation . . . you will be glad you did

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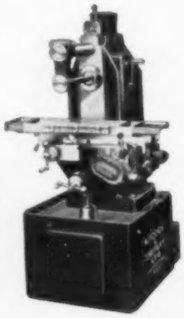
ADCOCK & SHIPLEY No. 2 JUR-Universal Milling Machine. Demonstrated under power, *performing a milling operation on steel at a feed rate of 15" per minute*



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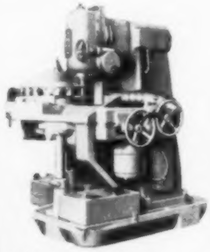

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2½ Seconds

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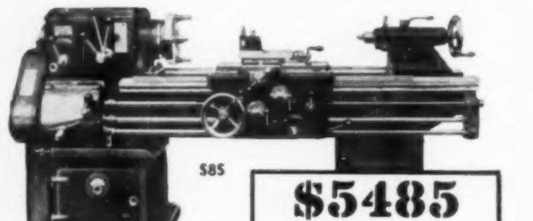

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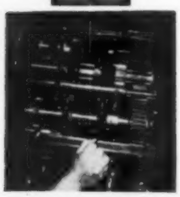

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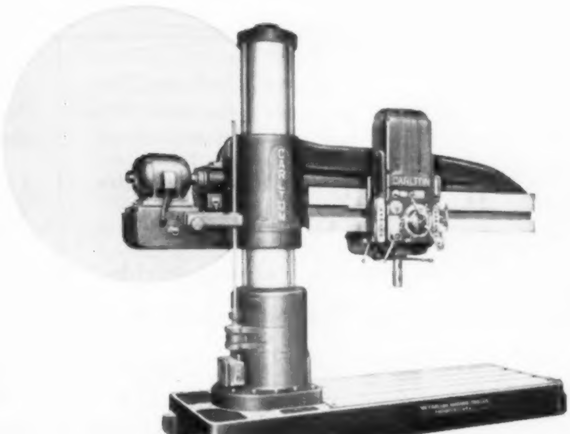

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HOW HOFFMAN FLOTATION UNITS HELP MAKE BETTER BALL BEARINGS

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the installation of money-saving Hoffman Flotation Units in the Fafnir Bearing Co. plant, these were among their coolant clarification problems:

1 — Short wheel life

2 — Part rejects

3 — Daily cleaning of each machine

4 — Dirty machines with resulting bacterial odor

after

the changeover to a central system in the Fafnir Bearing Co. plant and the utilization of Hoffman Flotation Units, these changes took place:

1 — Extended wheel life

2 — Improved quality, uniformity of parts

3 — Reduced machine clean-up time

4 — Bacteria and resulting odor eliminated

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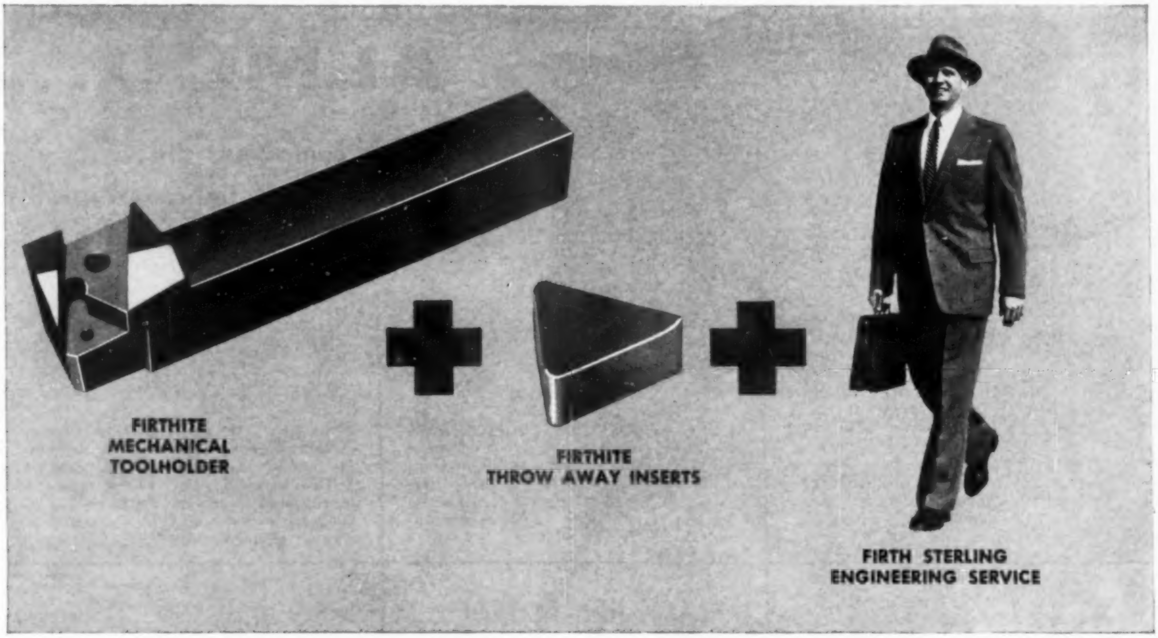

TOOL UP FOR ECONOMY

with this cost-cutting combination

There are two important reasons why thousands of metalworking plants are cutting costs with Firth Sterling mechanical toolholders, throw away inserts and engineering service. First, the broad experience and expert application knowledge of Firth Sterling engineers (yours at no cost) help you plan your tooling program for maximum savings. Second, in this complete line, Firth Sterling has toolholders and inserts—*exactly* right for *your* job:

THRIFTOOL—lowest cost toolholder made. Offers chipbreaker, rigid insert and rapid indexing for reduced set-up time.

ECONODEX—medium priced holder is ideal for jobs requiring positive rake. Carbide anvil and carbide chipbreak clamp assure long life.

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FIRTHITE INSERTS—most precise dimensionally—are available in a full range of Carbide grades and the new Firthite Cermet WF Grade. *Now available for the first time, high speed steel throw away inserts in two of Firth Sterling's top cutting grades—Circle C and Van Chip.*

To get help with *your* tooling problem from a Firth Sterling engineer, simply call your nearest Firth Sterling sales office or distributor. And for further information on Firth Sterling toolholders and inserts, write for descriptive bulletin MTI-3: FIRTH STERLING, INC., Dept. 100, 3113 Forbes St., Pittsburgh 30, Pa. Offices and warehouses in principal cities.

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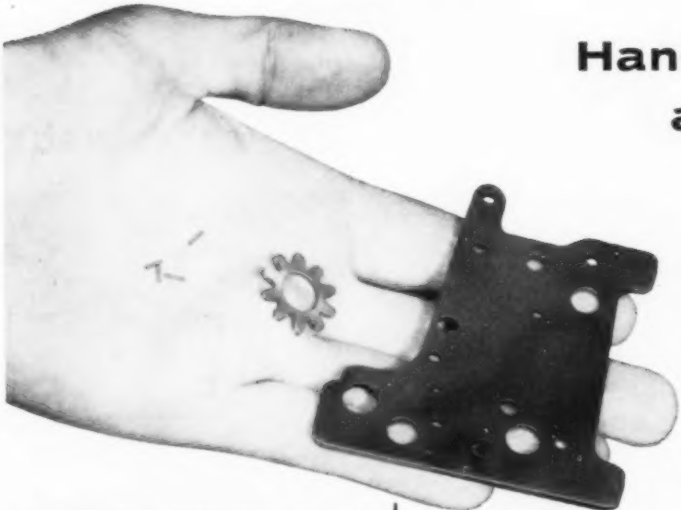
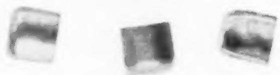


Hand Your Deburring and Finishing Problems to ALMCO...

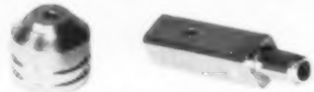
These companies did... and cut costs, improved quality, increased production.

DEBURRING of spark plug bushings by hand formerly caused many rejects at Canadian Pratt and Whitney. Costs were $104.20 per M with rejects totalling 12½%. Two Almco barrel finishing machines cut costs 97%, practically eliminated rejects.



SMALL GREASE GUN COUPLER JAWS (½" x ⅜") couldn't be deburred manually at a midwest screw products firm. With an Almco barrel finishing machine, 40,000 coupler jaws can now be deburred in 10 hours. Jaws are smooth, uniform, ready for plating.

DEBURRING AND POLISHING by manual methods proved expensive for delicate instrument and fountain pen parts at J. Bishop & Co. Almco barrel finishing machine increased output from 200 to 6000 parts per hour, cut costs 98.8%. Annual savings: $6,917.50.



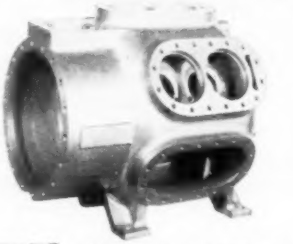
INCREASED PRODUCTION quotas demanded faster finishing at Alco Valve Co. Hand deburring and polishing finished only 200 stainless steel parts per hour. Almco machines are now barrel finishing over 1400 per hour, and to stricter finishing specs. Plant production needs are easily filled.

FILING burrs by hand formerly cost $55 per 100 needle plate forgings at Landis Machine Co. Now an Almco barrel finishing machine has cut finishing costs to 55 cents per 100 parts. Parts are uniform, rejects are eliminated. Savings come to 99%!

See Barrel Finishing In Action At Our Display, Booth 2101, ASTE Show, Philadelphia

Large Parts too are Almco Barrel Finished!

AT AN IOWA FOUNDRY, an Almco barrel finishing machine deburrs, polishes 48 large wash machine agitators per hour. Fixtures hold castings firmly within Almco barrel. Rough edges are completely removed; castings are highly polished; appearance is improved.



AT AIR CONDITIONING FIRM, compressor housings weighing over 100 lbs. are Almco barrel finished. Almco process breaks sharp edges of castings, cleans internal surfaces, and improves surface finishes. Two housings are cleaned in 20 minute cycle! Workmen are relieved for other plant tasks!

Send Your Parts to Almco's Modern Test Laboratory.

Sample parts processed without obligation. Simply write on letterhead, sending parts direct to Albert Lea, enclosing specifications required. Complete, free report includes recommendation. 52 PAGE HANDBOOK ON BARREL FINISHING SENT ON REQUEST.

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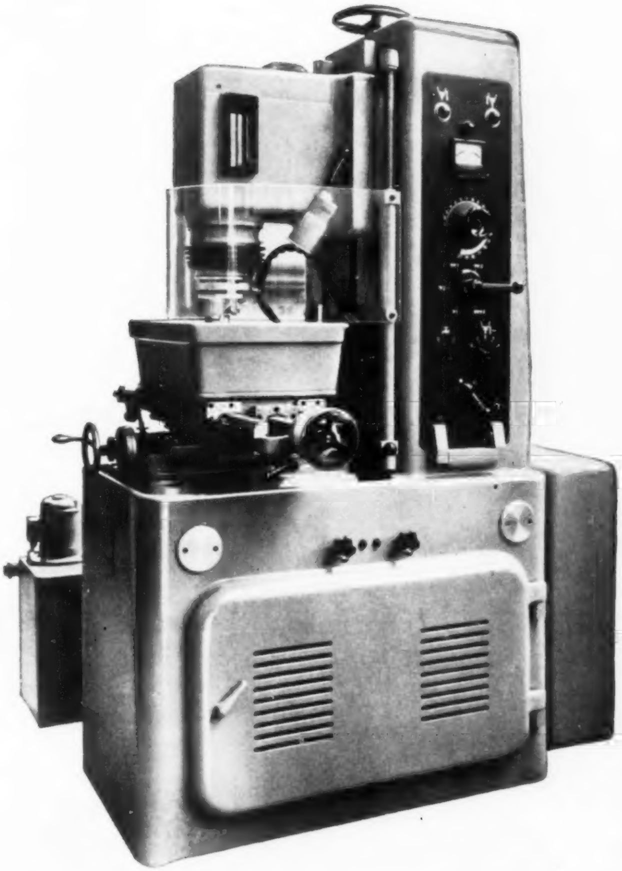

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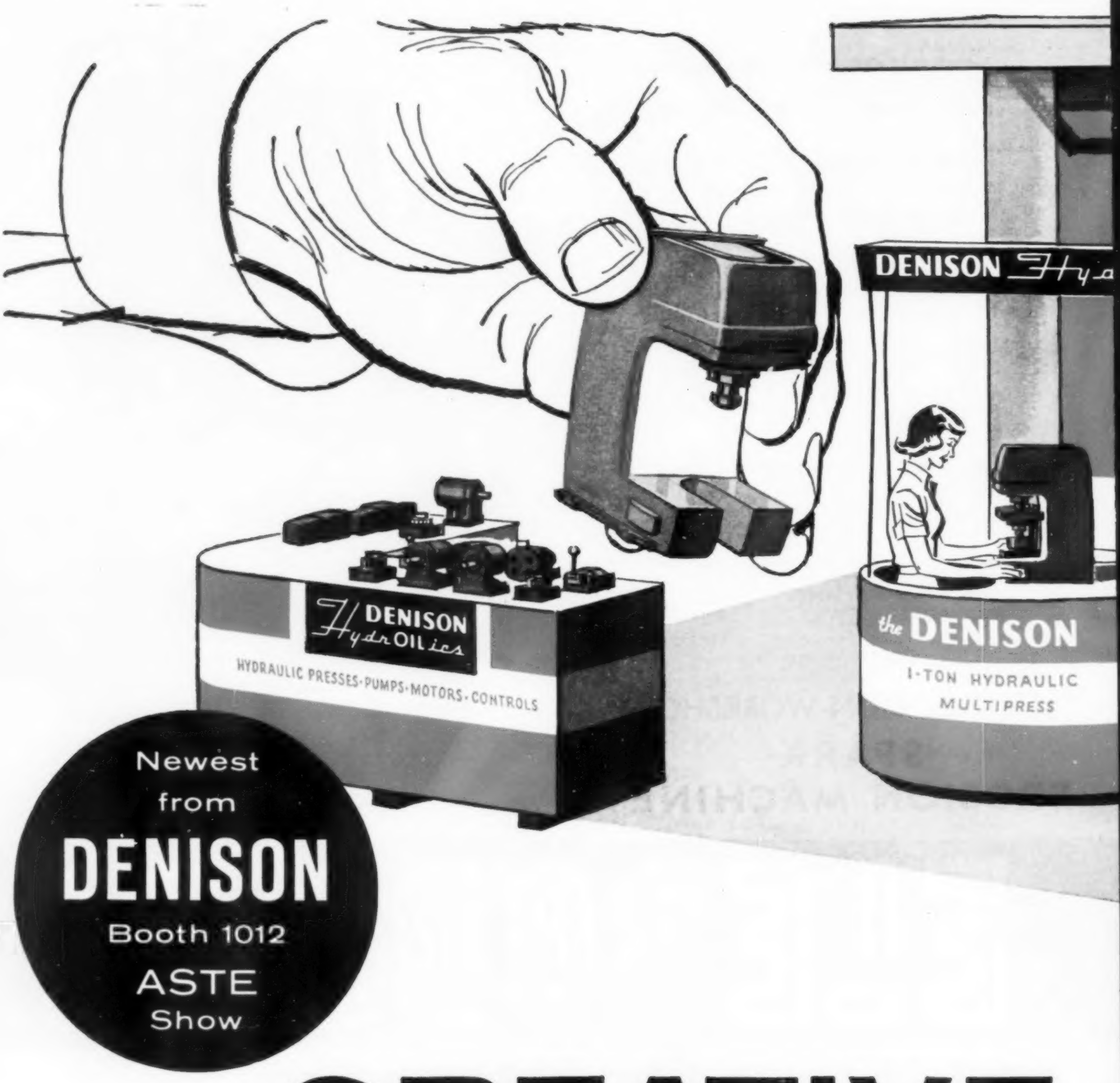

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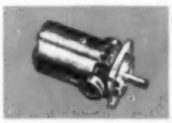
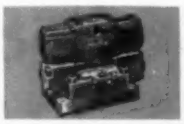

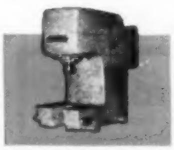

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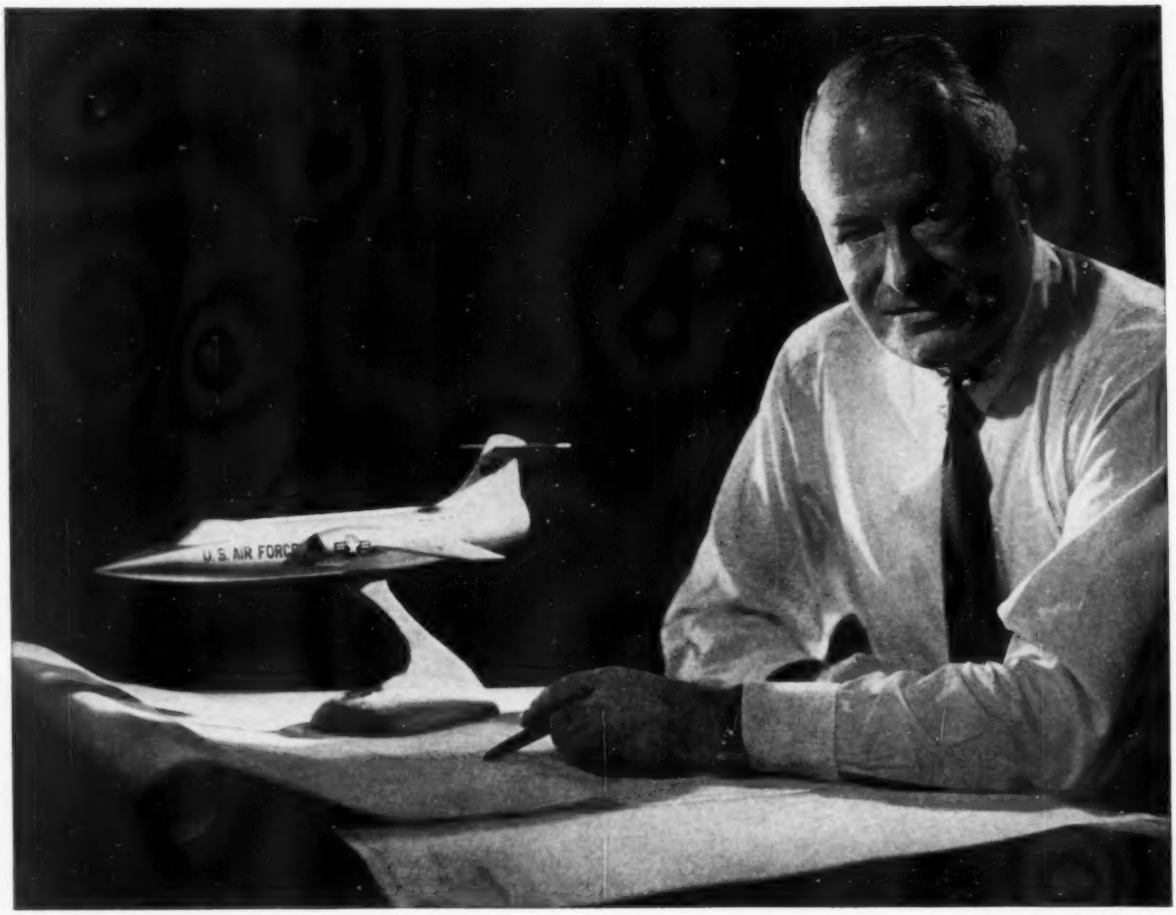

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Portrait by Fabian Bachrach

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ROBERT E. GROSS, ***Chief Executive Officer,***
Chairman of the Board,
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Cycle data: 2 cuts, 413 strokes per minute, stroke .875 in. rotary feed .014 in. per stroke, cycle time 3.2 minutes.

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The SYKOMATIC is the latest machine from the well-known Sykes organisation. An advanced type of gear shaper, the SYKOMATIC has a rotary turret magazine holding a number of gear blanks. The number of components to be held in the turret depends on their size. Automatic cycling or single component action may be engaged at will.

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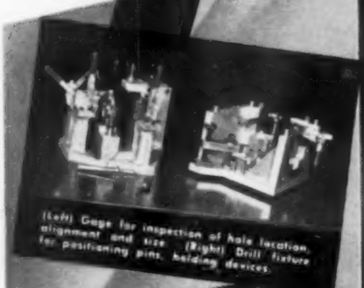
TOOLING PLATE is the choice of TOOL ENGINEERS



(Left) Gage for inspection of hole location, alignment and size. (Right) Drill fixture for positioning pins, holding devices.

Drill fixture mounted in tandem, indexes from drill to ream operation. All holes are held to .0015" for location.

Drill fixture with dual use; as shown in boring operation on Bullard mill; then by use of template and adapter, on drill press.

Four-spindle profiler with two fixtures, with jet control body in place. Required tolerance: ± .001" on squareness and face height.

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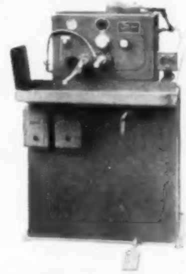

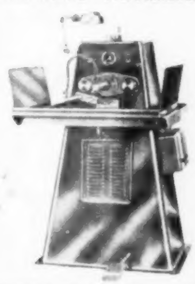

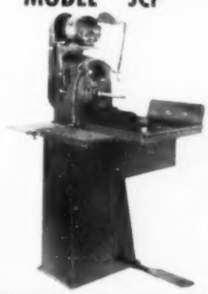

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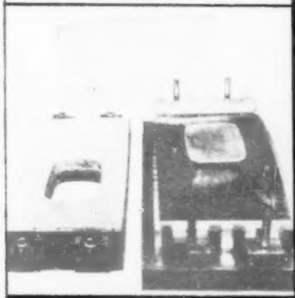

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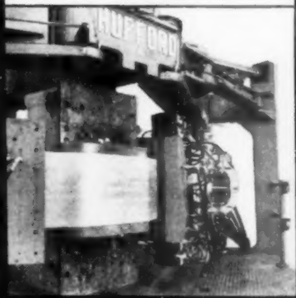

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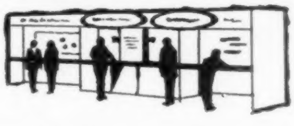
26th ANNUAL ASTE SHOW



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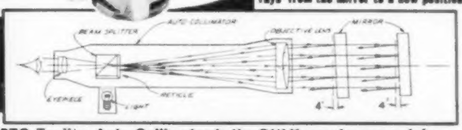

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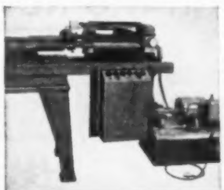

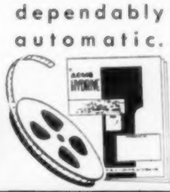

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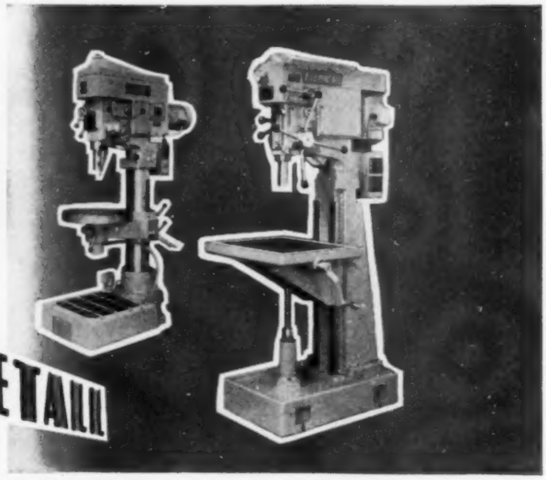

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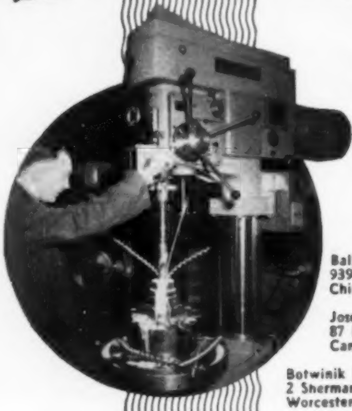

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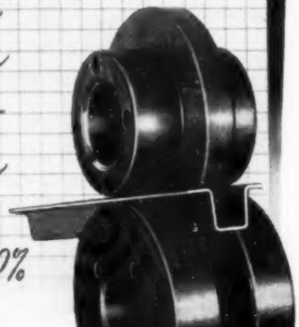

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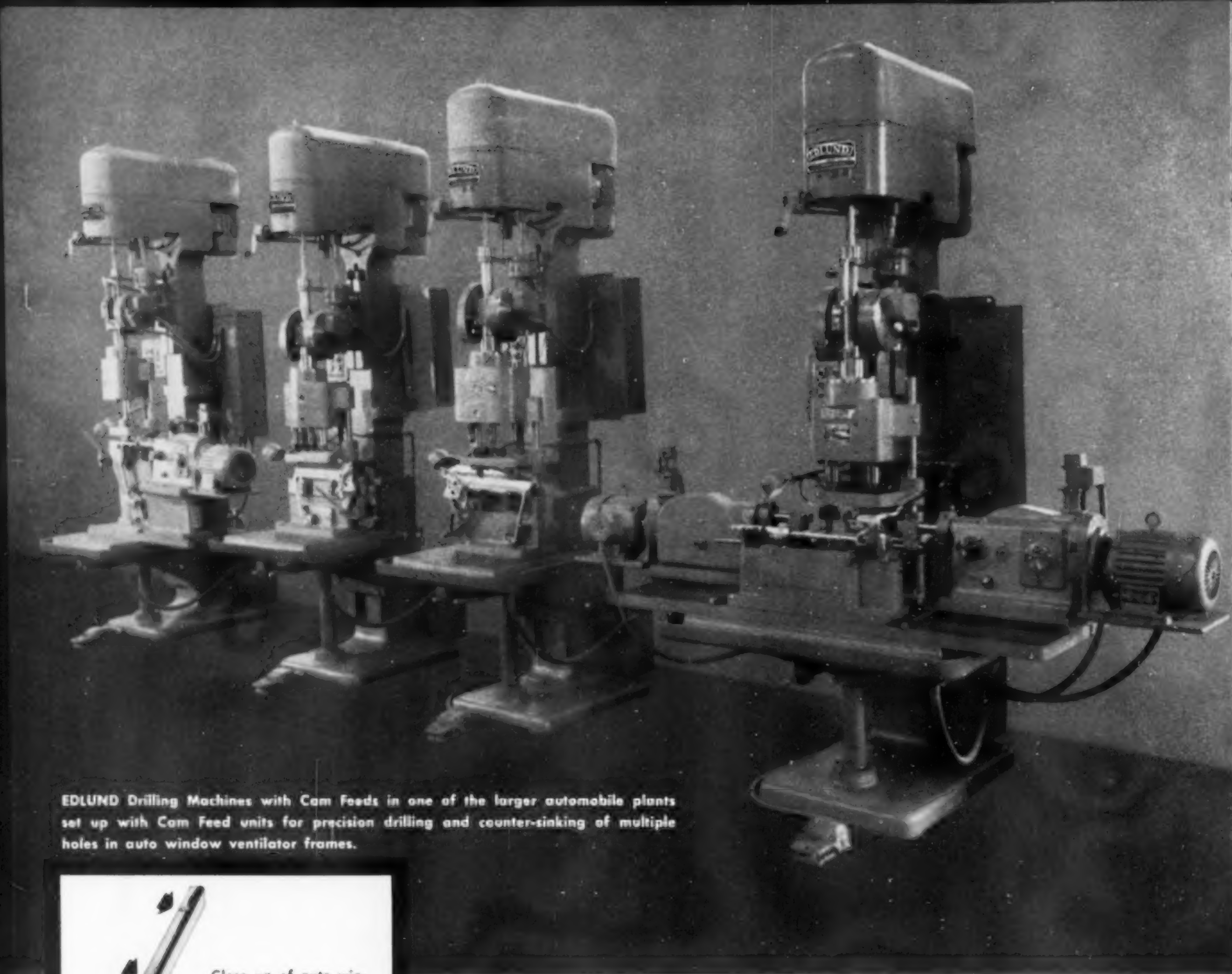

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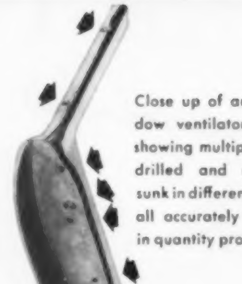

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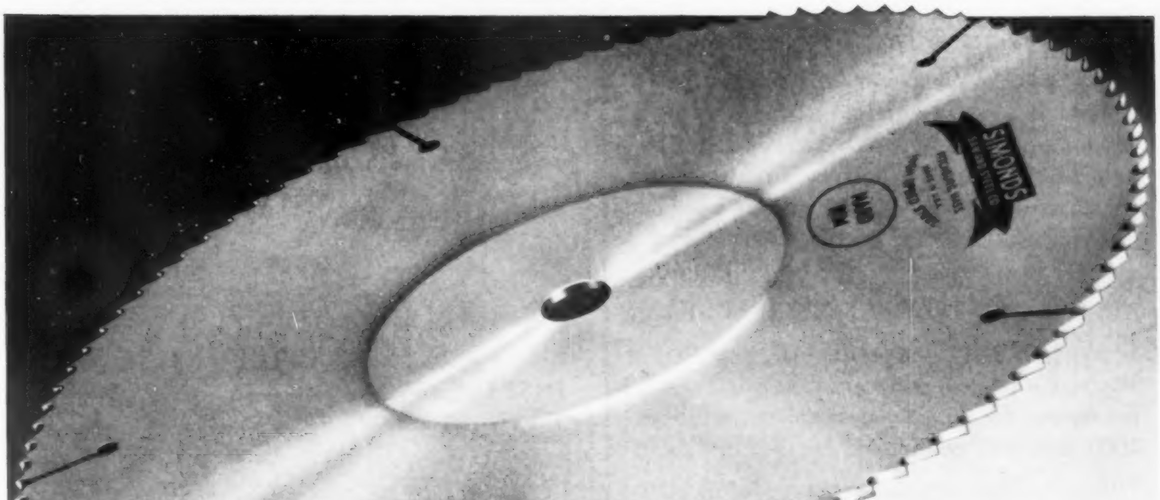

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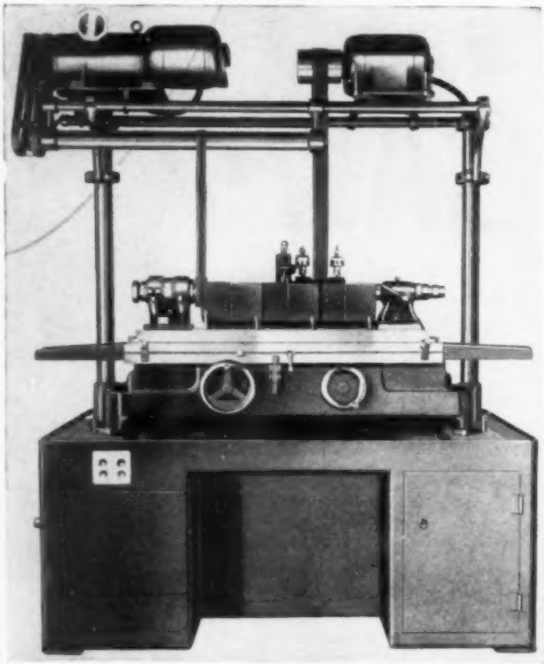

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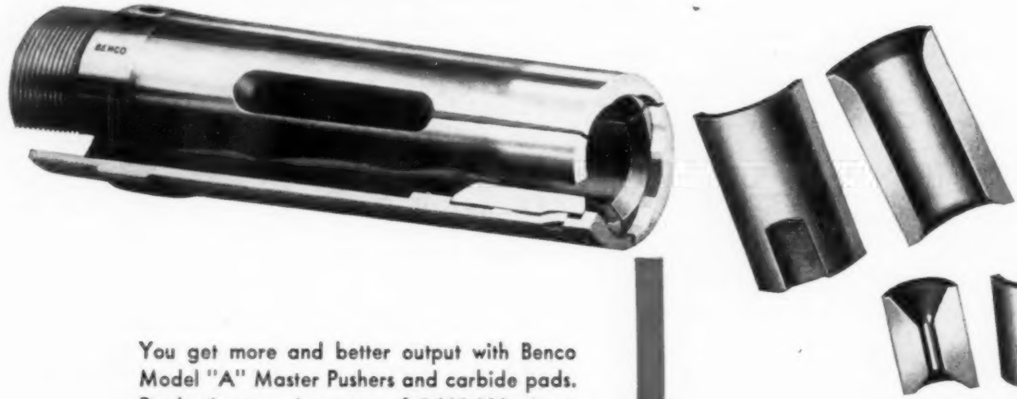

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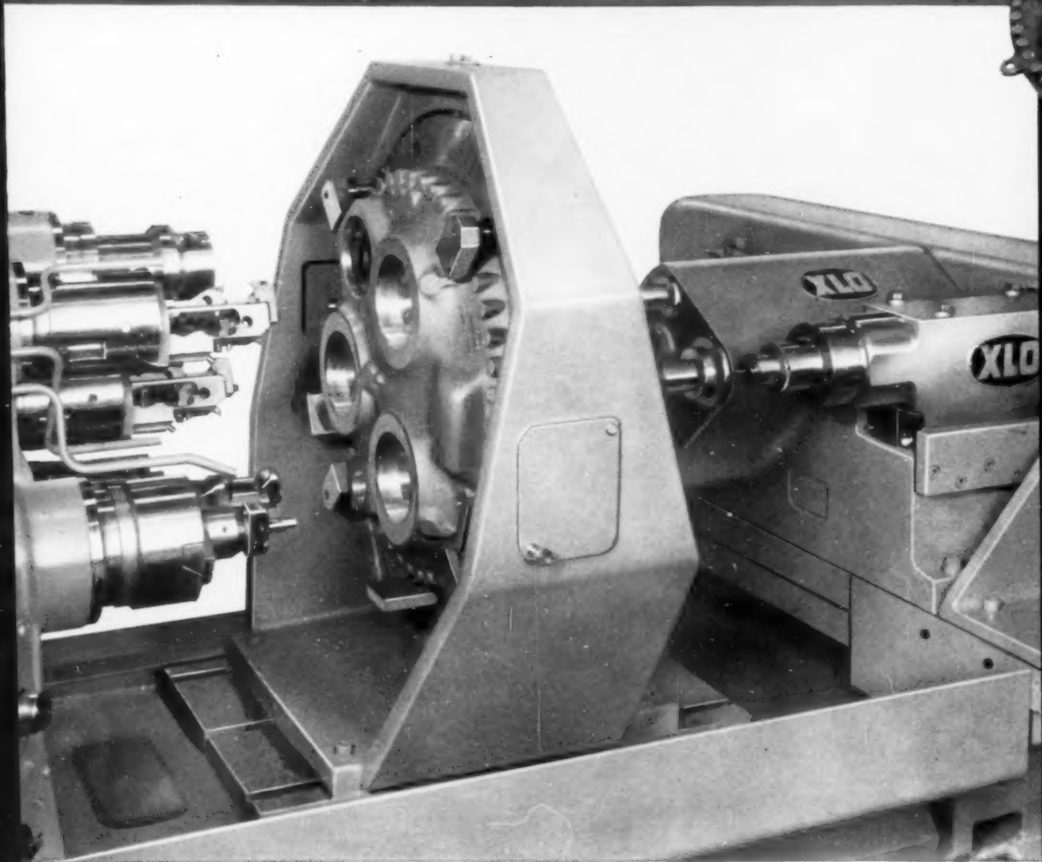
How to precision finish 42 surfaces in one cycle



Back and front view of the bored casting. Part will eventually house a precision gear train. All hole sizes and locations are held to .001" tolerances.

Close-up of part mounted in its hydraulically-operated fixture. Notice straddle facing tools mounted on boring spindles.

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These magnesium cast aircraft gear housings are being bored, faced and chamfered, 42 precision operations overall in one cycle on a single Ex-Cell-O 17-A precision boring machine! What's more, all diameters and locations are being held to .001" tolerances.

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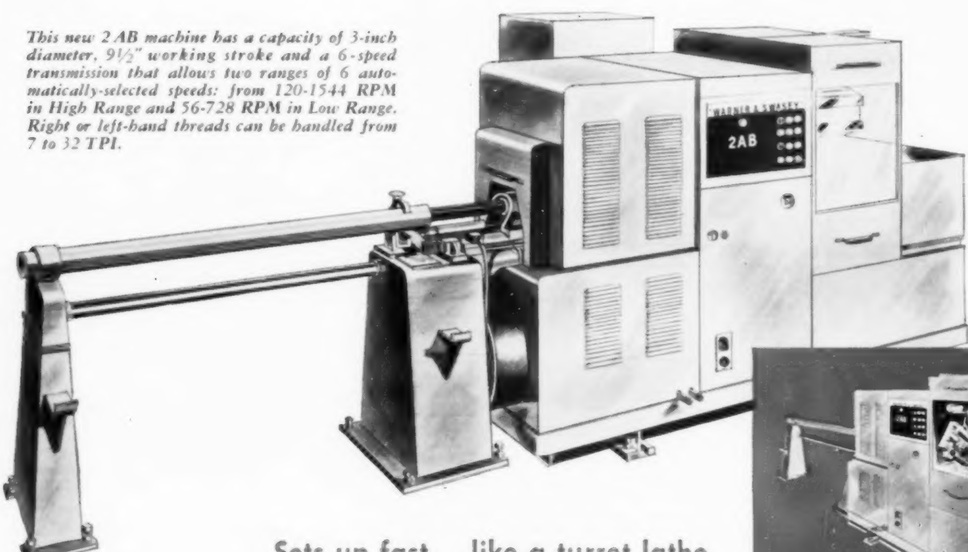
NEW! Warner & Swasey 2 AB Single Spindle Automatic Bar Machine

...provides fast, automatic production of short, medium, or long-run precision bar jobs

This new 2 AB machine has a capacity of 3-inch diameter, 9½" working stroke and a 6-speed transmission that allows two ranges of 6 automatically-selected speeds: from 120-1544 RPM in High Range and 56-728 RPM in Low Range. Right or left-hand threads can be handled from 7 to 32 TPI.



Sets up fast... like a turret lathe

Now, the shop-proven, cost-cutting features which have made Warner & Swasey Automatic Chuckers so outstanding in their field are available in a new Single Spindle Bar Automatic. Most important among the profit-producing features of this new Warner & Swasey 2 AB are:

● **FASTER SETUPS** — With no cams to change, time-consuming set-up procedures, usually encountered with automatic bar machines, are eliminated. Even your smallest lot bar jobs can now be produced economically on an automatic basis.

● **GREATER ACCURACY** — Only two wide—and widely-spaced—bearing surfaces support the turret. Thus, cumulative tolerance problems in conventional "multiple bearing" turret location designs are eliminated.

● **EASIER TOOLING FOR COMPLEX WORK** — Flexibility and accessibility of the 2 AB's cross slides and pentagon turret enable the use of a wide variety of machining methods. One operation usually handles even the most complex workpieces.

● **POWER FOR TOMORROW'S JOBS—TODAY** — The 2 AB's 25 horsepower, reversible motor more than meets today's rugged metal removing requirements and, coupled with a wide range of spindle speeds, permits the efficient application of the latest cutting tool materials.

● **"FREE" CUT-OFF TIME** — An independently-operated cut-off slide allows full utilization of both front and rear cross slides. The cut-off cycle may be started during any one of the pentagon turret stations. Thus, cutoff can be progressing during subsequent machining providing a cut-off cycle which is virtually "free".

● **AUTOMATIC RESTOCKING INDICATOR** — This ingenious device in the hydraulic bar feed mechanism automatically stops the 2 AB and lights an indicator light on the operator's control panel before the bar being machined runs out—prevents tool damage from improperly-gripped stock.

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